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Hugh Cecil Earl of Lonsdale.

1873.

347 Practical Horse-Shoeing. By G. Fleming, F.R.G.S., M.A.I., etc., Member of Council of the Royal College of Veterinary Surgeons; Veterinary Surgeon Royal Engineers; Author of "Travels on Horseback in Mantchu Tartary," "Horse-Shoes and Horse-Shoeing," "Animal Plagues," "Rabies and Hydrophobia," etc. Second Edition, revised and enlarged. London. 1873.

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BY

G. FLEMING, F.R.G.S., M.A.I., Etc.,

Member of Council of the Royal College of Veterinary Surgeons; Veterinary Surgeon Royal Engineers; Author of "Travels on Horseback in Mantchu Tartary," "Horse-Shoes and Horse-Shoeing," "Animal Plagues," "Rabies and Hydrophobia," &c.

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PREFACE TO THE SECOND EDITION.

It must be a source of satisfaction to those who are interested in the welfare and efficiency of the Horse, to find that at last there is some prospect of a common-sense and humane method of shoeing being introduced, and that a large amount of interest is manifested in the subject.

This is evidenced by the fact, that an edition of fifteen hundred copies of "Practical Horse-shoeing" was disposed of in a few months after its publication; and that its re-publication in the United States (unauthorised though it was) by Appleton & Co., of New York, immediately subsequent to its issue here, is as likely to be attended with even greater success, the Massachusetts Society for the Prevention of Cruelty to Animals having alone taken a thousand copies for distribution among the farriers of that State.

This large circulation must doubtless prove eminently gratifying to the Scottish Society for the Prevention of Cruelty to Animals, and still more so to the worthy lady by whom the prizes for essays on Horse-shoeing given by that Society were so liberally provided.

For myself, I rejoice to think that the principles which should guide us in the management of the Horse's foot, and for whose introduction I and others have contended for many years, are at length being adopted.

In the present edition, a few additions and trifling corrections have been made, and the number of illustrations has been increased. No attempt has been made to alter the plan of the essay, which was chiefly designed for farriers, or those who, beyond my own profession, took an interest in the matter.

The subject of pathological farriery is too large and complicated to be introduced, and, in fact, it did not come within the terms or scope of the essay, the main object of which was to indicate to what an extent disease might be prevented and utility increased. Pathological shoeing belongs more to the veterinary surgeon's than to the farrier's domain, but it has not been overlooked by me; and in due course a work on this very important section of veterinary science will be offered for acceptance.

GEORGE FLEMING.

Brompton Barracks,

Chatham, February, 1873.

PREFATORY NOTE

TO THE FIRST EDITION.

It is a painful reflection that the advance of civilization seems ever to be accompanied by an aggravation of certain evils,—and in no instance is this more marked than in the terrible amount of suffering unnecessarily endured by the Horse.

This animal, pre-eminently the most useful to man, is the one upon which is inflicted, either wantonly, or through sheer ignorance, or thoughtlessness, the greatest amount of cruelty. The records of all humane societies show that, of prosecutions for cruelty to animals, an overwhelming majority refer to the Horse; and of these, a large proportion are for working horses while suffering from lameness, in one form or other. So frequent are such cases, that observers have concluded that its prevalence must result from some specific cause, and, not unnaturally, attention has thus been directed to the various modes of management practised in relation to the horse's foot, to the manner of shoeing, and, in particular, to the way in which the hoof is prepared for the shoe.

Convinced that very much suffering results from imperfect knowledge of the Anatomy of the Foot, and of the true functions of its various parts, and from consequent mal-practice in its treatment, especially in the application of the shoe, the use of which is needed solely to prevent the undue waste and wear caused by severe labour over hard, rough, and unyielding roads, the Committee of the Scottish Society for the Prevention of Cruelty to Animals offered, in July, 1869, a series of prizes for "the best and most practical essays on Horse-shoeing, in connection with the comfort and soundness of the Horse." By August, 1870, upwards of forty essays were sent in. These were submitted to Professor Williams, Principal of the Edinburgh Veterinary College, Mr. W. Robertson, M.R.C.V.S., Kelso, and Mr. B. Cartledge, M.R.C.V.S., Sheffield, Examiners of the Royal College of Veterinary Surgeons, and Mr. J. C. Broad, M.R.C.V.S., London, by whom, after a very patient and careful examination, the prizes were awarded, —the *first*, to Mr. George Fleming, for the treatise now in the hands of the reader; the *second*, to Mr. T. D. Broad, M.R.C.V.S., Bath; and the *third*, to Mr. George Armatage, M.R.C.V.S., late Secretary of the Central Veterinary Medical Society, London.

A large proportion of the essays exhibited much thoughtful care in their preparation, combined at once with scientific knowledge and practical acquaintance with

the subject in hand; and it has been most gratifying to find so general a concurrence among the writers in their utter condemnation of the common, but unscientific and irrational, practice of paring away the sole and frog as a necessary preparation for shoeing. The unanimity exhibited on this most important point sinks into comparative insignificance all differences of opinion on minor points. The Committee are thus able confidently to recommend the following pages as a clear and able exposition of the views, not only of the author of one of the best and most exhaustive works on the subject, but also of very many of the most enlightened veterinary surgeons of the day.

H. S. A. L. HAY, V.P.,

Late Secretary Scot. Soc., P.C.A.

EDINBURGH,

February, 1872.

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PRACTICAL HORSE-SHOEING.

IMPORTANCE OF THE ART.

It requires but little observation and reflection, one would think, in order to arrive at the conclusion that the art of "Horse-Shoeing" is not only an important one, so far as civilization and the ordinary everyday business of life is concerned; but that the successful utilization of the horse, together with his welfare and comfort, in a great measure depend upon the correctness of the principles on which its practice is based, and the mode in which these principles are carried out by the artizan.

For proof of this, we have but to glance at the immense traffic in our great towns and cities, in which the horse figures so prominently; at the same time remembering, that without a defence to its hoofs, this invaluable animal would be almost—if not quite—valueless, in consequence of the hardness of our artificial roads, and the great efforts demanded from him; or, studying the anatomy and functions of the limbs and feet, to call to mind how these are wonderfully calculated to serve most essential purposes in locomotion and weight-sustaining, and

how necessary it is at the same time that their natural adaptability be as little as possible thwarted or annulled by the interference of man, in his endeavour to protect or aid them.

From the earliest ages, the horse's foot and its envelope, the hoof, have been looked upon by horsemen as the principal region of the animal's body to which care and attention should be directed: as when these become injured or diseased—no matter how perfect and sound the other parts may be—the quadruped's services are diminished or altogether lost.

Consequently, the preservation of these in an efficient and healthy state has ever been the aim of those who valued the horse for the immense advantages his services were capable of conferring on mankind; and, in later years, those who have been moved by the sacred impulse of humanity towards the lower creatures, have not forgotten how much the noble animal may suffer from unskilful management of his feet, through the neglect or ignorance of those who have the special care of these organs.

At a very early period in the domestication of the horse, and particularly in Western regions, it must have been soon discovered that at certain seasons, on particular soils, and especially when called upon to perform any great amount of travelling and load-carrying, the horn composing the hoof underwent an amount of wear greater than Nature could compensate for; and that the living sensitive structures within, becoming exposed and irritated by contact with the ground, were injured, and gave rise to pain, lameness, and inability to work.

To guard against this serious result, the ingenuity of man must have been severely tested in devising a suitable and durable protection for the ground surface of the hoof; and among the many contrivances proposed, the most notable, and by far the most valuable, has been the device of nailing a plate of metal to the outer margin or *wall* of the hoof.

The antiquity of this invention is very great; and it is probable that for many centuries the shoe was considered as nothing more than a simple defender of the hoof from the damaging effects of wear, and occasionally as an aid in securing the animal's foothold during progression on slippery ground.

As time advanced, however, and the services of the horse became increased a hundredfold by the application of this ingenious and simple expedient, the sciences of anatomy and physiology began to embrace the horse in their domain; and, crude as they were at first, it is to be feared that when they were extended to the investigation of the structure and functions of the foot, the useful and comparatively harmless protection of early days was made subservient to the most varied and fantastic theories. For it must be admitted that, in recent times, horse-shoeing, so far from proving a boon to horse-owners and a preserver of horses' feet, has been far from yielding the benefits its scientific and reasonable application should afford; indeed, it would be no exaggeration to assert that the predominating principles and practice of this art have been eminently destructive to horses, and a source of great loss to their proprietors.

These principles were founded on a misconception of the functions of the foot, and of the part assumed by the hoof in

locomotion; and their speedy popularization was due to the fact that they were congenial to the whims of fashion, and were deemed essential to the improvement of nature: commending themselves to unreasoning and unreasonable minds, like the fashions of cropping horses' and dogs' ears, cutting, nicking and docking tails, and other cruel fancies of depraved tastes.

The amount of injury inflicted by an unscientific method of shoeing may be very much greater than a cursory inquiry would lead one to believe. To those experienced among horses, and who have directed their attention closely to the subject, the proportion of animals whose utility is directly or indirectly impaired by improper treatment of their feet must appear excessive, when compared with the other causes of inefficiency. Indeed, maladies of the feet and limbs, due, more or less, to faulty shoeing, form a very large percentage of the cases usually met with in veterinary practice.

An art, therefore, which has so much influence for good or evil, so far as the usefulness and comfort of the horse are concerned, surely deserves the serious study of all who are interested in that animal. A good system, founded on the teachings of anatomy and physiology, and perfected by daily experience, must prove of immense benefit to horse and owner; while a bad system, conducted in ignorance, carelessness, or mistaken notions, cannot but bring about pain and speedy uselessness to the animal, and loss and inconvenience to its proprietor.

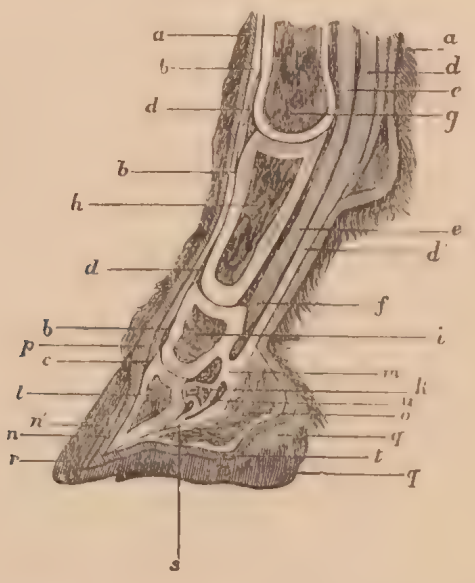
ANATOMY OF THE HORSE'S FOOT.

One of the primary considerations for those who have the shoeing and management of the horse's foot, should be the acquisition of a knowledge of its structure and functions in health: not a profound knowledge, certainly, such as the scientific veterinarian requires, but sufficient to enable them to understand the situation, relation, texture, and uses of the parts of the organ with which they have more particularly to deal. If the artizan does not possess this knowledge, is it possible that he can practise his handicraft to advantage, or minister effectually to the varied requirements of this organ? It must be admitted that he cannot do so; and it is from neglect of this fundamental consideration that so much improper and vicious shoeing prevails, and that so many horses are crippled and prematurely worn out. By the majority of farriers the foot of the horse is looked upon as little, if anything, more than an insensible block of horn which they may carve and mutilate with impunity, and as suits their fancy, and for which nothing more is necessary than the attachment, by an unreasonable number of nails, of a clumsy mass of iron that may not only be unsuitable for its requirements, but positively injurious to it and the other parts of the limb. The art of farriery in this country has never received a scientific development, but has ever been a mere affair of routine and tradition. Such should not be the case; and allusion is only made to this matter here in order to urge most strenuously the necessity for farriers being

properly instructed in the elements of their art, and made to comprehend as much as may be required of the construction and functions of the very important organ upon which they are destined to exercise their skill.

The horse's foot may be said, for practical purposes, to be intended not only as an organ of support and defence (or offence), but also as that part of the limb in which the efforts

Fig. 1.



Section of the Horse's Foot.—*a a*, Skin of leg. *b b b*, Extensor tendon of foot; *c*, its insertion into the foot-bone. *d d*, Capsular ligament of joints. *d' d'*, Flexor tendon of foot inserted into sole of foot-bone (*s*). *e e*, Flexor tendon of pastern inserted at *f* into the small pastern bone, *i*. *g*, Shank or large metacarpal bone. *h*, Large pastern bone. *k*, Navicular bone. *l*, Foot or pedal bone. *m*, Ligaments of navicular bone connected with deep flexor tendon. *n*, Sensitive laminæ, dovetailing with horny laminæ, *n'*. *o*, Plantar cushion. *p*, Coronary cushion. *q*, Horny frog. *r*, Wall of hoof. *t*, Sensitive membrane of frog and sole. *u*, The face of the navicular bone over which the flexor tendon plays—the seat of navicular disease.

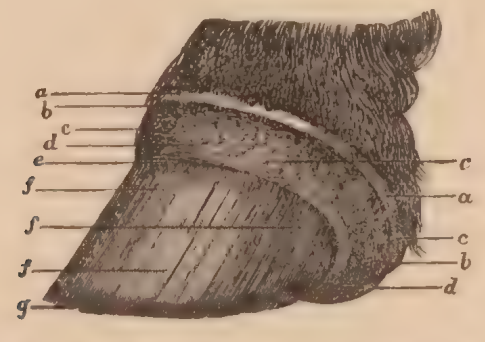
created elsewhere are concentrated, and as the instrument through which propulsion and progression may be mainly effected. It is also largely endowed, in a natural state, with

the sense of touch, which enables the animal to travel with safety and confidence on rough as well as even, and on soft as well as hard ground.

When we come to examine it in a methodical and careful manner, we find that it has for its basis the last three bones of the limb—the small pastern (Fig. 1, *i*), navicular (*k*), and coffin or pedal bone (*l*). The latter is more particularly the foundation of the foot, and is the nucleus on which the hoof is moulded, and which in shape it much resembles. Into its highest point in front, the large extensor tendon of the foot is inserted (*c*), and in the middle of its lower face, or sole, is implanted the powerful tendon which bends or flexes the foot (*d'*, *d'*, *s*); these tendons are the chief agents in progression. An elastic apparatus surrounds them and a portion of the pedal bone, and the whole is enveloped by a membrane that attaches the hoof in the closest possible manner to its outer surface. Into each of the wings or sides of the bone (for it is crescent-shaped, the horns extending backward on each side) is fixed a large plate of cartilage that rises above the hoof, where it may readily be felt; this plate has important relations with its fellow on the opposite side, as well as with other elastic bodies admirably disposed to sustain weight, prevent jar, and ensure that lightness and springiness which form so striking a feature in the horse's movements. The navicular bone is a narrow piece, placed transversely between the wings of the coffin bone behind, and is intended to throw the flexing tendon further from the centre of motion, and thus increase its power; the tendon plays over its posterior or lower face, and this

disposition, together with the relations established between it and the pedal bone through their connecting ligaments, and

Fig. 2.



HORSE'S FOOT DIVESTED OF ITS HOOF.—*a a*, Perioplic ring. *b b*, Perioplic or coronary fissure. *c c c*, Coronary cushion covered with villi. *d d*, White zone. *f f f*, Vascular or sensitive laminæ (or leaves) terminating in villi, *g*.

the bend the tendon makes in passing over it, cause this part of the foot to be one particularly liable to disease, and one especially deserving of attentive study.

The elastic apparatus of the foot consists of (1) the lateral cartilages just mentioned; (2), a prominent ring or cornice surrounding the upper border of the pedal bone usually known as the "coronary-substance," but which might be more aptly designated the "coronary cushion" (Figs. 1, *p*, 2, *c*); this fits into a corresponding concavity in the inner and upper margin of the wall of the hoof, and, besides acting as an elastic body or cushion, performs the important function of secreting or forming this wall or crust of the horny envelope; (3), a triangular body—the plantar cushion (Figs. 1, *o*, 3, *b*, *f*), known to farriers as the "fatty" or "sensitive frog" (to distinguish it from the horny frog, which immediately covers it), admirably disposed between the wings of the coffin bone, with a view to protect

and sustain the flexor tendon during its efforts, as well as to diminish concussion by its own resiliency (or springiness), and by the connection it has with the elastic cartilages. From its position at the back of the foot, and the importance of the parts it covers, this portion of the elastic apparatus derives much interest, and must not be overlooked by the farrier.

Besides the elastic apparatus of the foot more immediately in connection with the pedal and navicular bones, we have the wonderful arrangement of living membrane enveloping these parts, and whose office appears to be the secretion and attachment of the horny box we designate the "hoof." To it large quantities of blood are conveyed by the ultimate ramifications (or terminations) of the arteries proceeding to the foot, and that fluid is carried from it by a complex distribution of veins arising from these minute arterial divisions, to the great venous trunks that pass up the limb. The terminal twigs of the nerves of sensation of the foot are also freely and wisely distributed in its substance, in the form of exceedingly fine filaments, which endow the organ with a sufficient sense of touch to enable it to perform its varied functions with safety and precision. A peculiar and striking disposition or arrangement of this membrane can be observed around the front and sides of the pedal bone, when the hoof has been removed by steeping the foot for some time in water. This disposition consists in the elevation of the membrane into parallel vertical leaves, which extend from the coronary cushion to the lower border of the bone, and to a certain distance within its wings (Fig. 1, *n*, 2, *f*). These leaves, which resemble in appearance those on the under side of a

mushroom, are known as the "vascular" or "sensitive laminæ," and number between 600 and 700; their chief use seems to be to afford a wide and close attachment for the wall of the hoof, within which, through their agency, the pedal bone is, as it were suspended; so that the relations between bone and hoof are not so rigid and unyielding as if they were directly united to each other. These laminæ are exceedingly vascular and sensitive, and when they become inflamed through bad shoeing, excessive travelling, or other causes, the horse suffers the most excruciating pain, and in a large majority of cases the chronic inflammation that remains produces serious alterations in the

Fig. 3.

Sensitive Sole of Horse's Foot.—*a*, Cartilaginous bulbs of the heels, covered by sensitive membrane. *b*, Inflexion of the coronary cushion. *c*, Middle cleft or lacuna. *d d*, Plantar laminæ. *e*, Limit between the coronary cushion and plantar laminæ. *f f*, Branches of the plantar cushion. *g g g g*, Termination of the laminæ in villi. *h h*, Sensitive membrane of sole covered with innumerable fine tufts or villi. *i*, Prolongation of the coronary cushion into the lateral lacuna.

structure and formation of the hoof, leading to more or less lameness, deformity, and diminished utility. The inflammation and its results may even cause death in a short time.

Besides entering into the formation of these leaves, this membrane covers the other parts of the foot within the hoof,

as a sock does the human foot, and endows it with a high degree of vitality and secretory power; it overspreads the coronary and plantar cushions, as well as the sole of the pedal bone, and its surface in these parts is thickly studded with myriads of tufts or "villi," which give it the appearance of the finest Genoa velvet (Fig. 3, *g*, *h*). These minute processes vary in length from $\frac{1}{8}$ to more than $\frac{1}{4}$ inch, and are best observed when a foot, from which the hoof has just been removed by steeping for a long time, is suspended in clear water. Examined with the microscope, they are found to be merely prolongations from the face of the membrane, each being composed of one or two minute arteries, which branch off into an exceedingly fine network, and end in hair-like veins; a nervous filament has also been traced into the interior; so that these tufts are not only vascular, but sensitive. They play an essential part in the formation of the hoof, and their relations to that covering must not be neglected by the farrier in his treatment of it.

This is all that need be said at present with regard to the anatomy of the living parts of the horse's foot; we have referred to it merely to show that this organ is not a crude block of insensitive matter, but a most wonderfully constructed apparatus, possessed of qualities which are not to be found in any other part of the body. In constructing the foot of this noble creature, Nature sought to do more than merely protect the extremely delicate and exquisitely sensitive structures contained within the hoof from injurious contact with the ground. This redoubtable difficulty is comparatively insignificant, in compari-

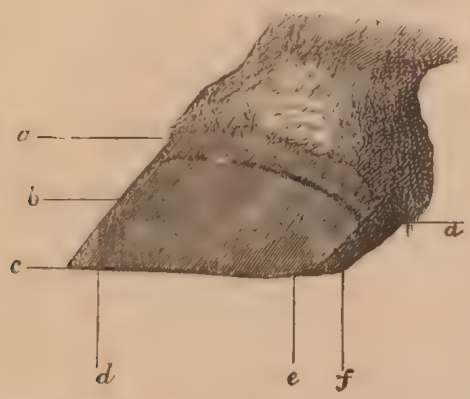
son with the other portions of the task she set herself. It was necessary that the lower extremity of the limb of such a glorious creation as the horse, should be an organ endowed with the acutest sense of touch for the instantaneous perception of the consistence and inequalities of the ground over which it moved; and while it possessed this quality in a high degree, it was also indispensable that it should be gifted with the properties of resistance, pliability, and lightness to the extent necessary for the support and progression of the body; in addition to the rigidity essential to impulsion, the elasticity and suppleness needful to avert reactions or jar, and the durability and rapidity of renovation demanded by incessant wear. Here we have a combination of requirements whose simultaneous existence in one organ might almost be deemed incompatible, so opposite do they appear: insensibility with a delicate sense of touch; resistance with lightness; rigidity with elasticity; and suppleness with durability.

THE HOOF.

The "hoof" takes no small share in rendering the horse such a complete animal as he is; and as this is the portion of the foot which comes more immediately under the care and manipulative skill of the farrier, its study should be a little more detailed and minute, perhaps, than that of the internal structures. For convenience and simplicity in description, it has been divided into "wall" or "crust," "sole," "frog," and "coronary frog-band" or "periople." It is most essential that the shoer should understand the structure, nature, and uses of these parts.

The *Wall* of the hoof (Fig. 4, *b*) is that oblique portion which covers the front and sides of the foot, from the coronet to the ground, and is suddenly inflected or bent inwards at the heels, towards the middle of the sole to form the "bars," which are merely prolongations of its extremities (Fig. 6, *f f*). It constitutes the circumference or margin of the hoof; is the part of the horny box that is intended more especially to come into contact with the ground, and is that on which the iron defence, or shoe, rests, and through which the farrier drives the nails that attach it. The inner face of its upper edge is hollowed out into a somewhat wide

Fig. 4.

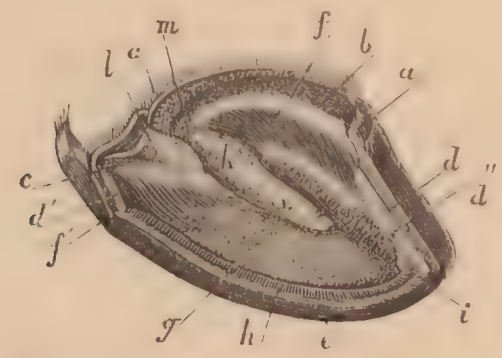


PROFILE OF A FIVE-YEAR-OLD FRONT HOOF THAT HAD NEVER BEEN SHOD: EXTERNAL FACE.—Angle of wall at toe 51°. *a a*, Frog band or periople. *b*, Wall. *c*, Toe, between which and *d* is the "outside" or "inside" toe or "mammilla," and between *e* and *f* the "outside" or "inside" heel.

concavity (Fig. 5, *b*), which receives, or rather in which rests, the coronary cushion. This concavity is chiefly remarkable for being pierced everywhere by countless minute openings—looking as if made by the point of a very fine needle—which penetrate the substance of the wall to some depth; each of these

perforations receives one of the "villi" or minute tufts of blood-vessels already mentioned as prolonged from the face of the membrane covering the interior of the foot. Below this concavity, which receives a large share of the horse's weight, the wall is of about equal thickness from top to bottom ; on the whole of its inner surface are ranged thin, narrow, vertical horny plates or leaves (Fig. 5, *f*), in number corresponding to the sensitive laminæ, between which they are so intimately received or dovetailed—a horny leaf between every two sensitive ones—that in the living or fresh state it is almost impossible to

Fig. 5.



THE HOOF, WITH ONE HALF THE WALL REMOVED TO SHOW ITS INTERIOR.—*a a*, Frogband. *b*, Cavity for the coronary cushion. *c*, Upper or inner surface of the "bar." *d*, Vertical section of the wall in front. *d'*, Ditto at the heel. *d''*, A horny leaf or lamina. *e*, Horizontal section of the wall at its junction with the sole. *f*, Laminæ or leaves of the wall. *f'*, Ditto of the "bars." *g*, Upper surface of the horny sole. *h*, Junction of the horny laminæ with the sole at the so-called "white line." *i*, Toe-stay at the middle of the toe. *k*, Upper surface of the horny frog. *l*, Frog-stay. *m*, Cavity corresponding to a branch of the frog. *n*, Ditto, corresponding to the body of the frog.

disunite without tearing them. The inner face of the lower margin is united in a solid manner to the horny sole, through

the medium of a narrow band of soft, light-coloured horn, situated between the two, and which we may call the "white line" (Fig. 5, *h*).

The outer surface of the wall is generally smooth and shining, in the natural healthy state.

The dimensions of the wall vary in different situations; in front it is deepest and thickest, but towards the quarters and heels it diminishes in height and becomes thinner; at its angles of inflection—the points of the heels—it is strong and thick. Its structure is fibrous; the fibres pass directly parallel to each other, and generally in a straight direction, from the coronet to the ground, each fibre being moulded on, as it is secreted by, one of the minute tufts of blood-vessels lodged in the cavity at the coronet. Microscopically, the wall is composed of minute cells, closely compressed, and arranged *vertically* around each fibre, and *horizontally* between the fibres. A point of much practical interest is to be found in the fact, that the fibres on the surface, or outside of the wall, are very dense, close, and hard (Fig. 5, *d*): so dense, indeed, that the wall of an unmutilated hoof looks like whalebone; but towards the inner surface, they become softer, lighter-coloured, more spongy, and easily cut (Fig. 5, *k*).

The *Horny Sole* (Fig. 6, *k*) is contained within the lower margin of the wall, and is a concave plate covering the lower face of the pedal bone. In structure it is fibrous like the wall, the fibres passing in the same direction; they are also formed in the same manner, by the tufts of vessels projected from the membrane which immediately covers the sole of the bone. These

tufts penetrate the horn-fibres to some depth, and, as in the wall, not only secrete them, but maintain them in a moist supple condition, such as best fits them for their office.

The sole is thickest around its outer border, where it joins the

Fig. 6.

PLANTAR SURFACE OF LEFT FORE HOOF OF A FIVE-YEAR-OLD HORSE THAT HAD NEVER BEEN SHOD.—*a a*, Glomes or heels of the frog. *b*, Median lacuna or "cleft" of the frog. *c c*, Branches of the frog. *d d*, Heels, "angles of inflexion," or "buttresses" of the wall of the hoof. *e e*, Lateral lacunæ or spaces between the frog and bars. *f f*, Inflexions of the wall or "bars." *g*, Body of the frog. *h*, Outside quarter of the hoof. *i*, Inside quarter of the hoof. *j*, Point of the frog. *k*, Sole. *l l*, Commissure, "white line," or line of junction between sole and wall. *m n*, Mammilla. *o*, Toe.

wall; thinnest in the centre, where it is most concave. A notable peculiarity in this part of the hoof, and one which distinguishes it from the wall, is its tendency to break off in flakes on the ground face when the fibres have attained a certain length; the wall, on the contrary, continues to grow downwards to an indefinite extent, and unless kept within reasonable dimensions by continual wear or the instruments of the farrier, would in time acquire an extraordinary length and distortion. The horn of the sole, for this reason, is less dense and resisting

than that of the wall, and is designed more to support weight than to sustain wear.

The "*Horny Frog*" (Fig. 6, *a, c, g, j*) is an exact reduplication of that within the hoof, which has been described as the *sensitive* or *fatty frog*. It is triangular, or rather pyramidal in shape, and is situated at the back part of the hoof, within the bars; with its point or apex (*j*) extending forward to the centre of the sole, and its base or thickest portion filling up the wide space left between the inflexions of the wall. In the middle of the posterior part is a cleft, which, in the healthy state, should not be deep, but rather shallow and sound on its surface (*b*).

In structure, this body is also fibrous, the fibres passing in the same direction as those of the other portions of the hoof; but instead of being quite rectilinear like them, they are wavy or flexuous in their course, and present some microscopical peculiarities which, though interesting to the comparative anatomist, need not be alluded to here. The fibres are finer than those of the sole and wall, and are composed of cells arranged in the same manner as elsewhere in the hoof; they are formed by the villi which thickly stud the face of the membrane covering the sensitive frog.

The substance of the horny frog is eminently elastic, and corresponds in the closest manner to the dense, elastic, epidermic pads on the soles of the feet of such animals as the camel, elephant, lion, bear, dog, cat, etc., and which are evidently designed for contact with the ground, the support and protection of the tendons that flex the foot, to facilitate the

springy movements of these creatures, and for the prevention of jar and injury to the limbs. When in constant contact with the ground, it is very hard and resisting on its lower surface, and as secure from injury from stones as any other part of the lower face of the hoof.

In the horse's foot, the presence of this thick, compressible, and supple mass of horn at the back of the hoof, its being in a healthy unmutilated condition, and permitted to reach the ground while the animal is standing or moving, are absolutely essential to the well-being of that organ; and more especially if speed, in addition to weight-carrying, be demanded from the horse.

The frog, like the sole, exfoliates, or becomes reduced in thickness at a certain stage of its growth; the flakes are more cohesive than those of the sole, and frequently we see a piece corresponding to the whole surface of the organ becoming detached.

It must be remarked, however, that this exfoliation of the sole and frog only takes place when the more recently formed horn beneath has acquired sufficient hardness and density to sustain contact with the ground, and to successfully bear exposure to the effects of heat, dryness, and moisture.

The "*Coronary Frog-Band*," or "*Periople*" (Figs. 4, *a*, 5, *a*), is a continuation of the more superficial layer of the skin around the coronet and heels, in the form of a thin, light-coloured band that descends to a variable depth on the outer surface of the wall, and at the back part of the hoof becomes consolidated with the frog, with which it is identical in structure and tex-

ture. It can be readily perceived in the foot that has not been mutilated by the farrier's rasp, extending from the coronet, where the hair ceases, to some distance down the hoof; it is thickest at the commencement of the wall, and gradually thins away into the finest imaginable film as it approaches the lower circumference of this part. Towards the heels it is broadest and thickest. When wet it swells and softens, and on being dried shrinks—sometimes cracks—in its more dependent parts, or becomes scaly.

The fibres composing it are very fine and wavy, as in the frog; they likewise grow from the villi which project from the true skin or membrane immediately above the "coronary cushion."

The use of this band would appear to be two-fold: it connects the skin with the hoof, and thus makes the union of these two dissimilar textures more complete, its intermediate degree of density and its great elasticity admirably fitting it for this office; and it acts as a covering or protection to the wall at its upper part, where this is only in process of formation, and has not sufficient resistance to withstand the effects of exposure to the weather. The greatest thickness and firmness of the band corresponds to the portion of the wall in which the villi or vascular tufts are lodged, and here the horn is soft, delicate, and readily acted upon in an injurious manner by external influences.

Thus far, then, we have rapidly glanced at the anatomy and uses of the various parts entering into the composition of the horse's foot, and its horny box or capsule—the hoof. It may be necessary, before we pass to the consideration of the latter as a whole, to allude to the structure and uses of that narrow strip

of horn, whose presence every farrier or veterinary surgeon is cognizant of, but whose character and functions have been strangely left out of consideration by all anatomists hitherto. I refer to the "white line"—the slender intermediate band that runs around the margin of the sole, and connects that plate of horn so closely to the wall as to make their union particularly solid and complete (Figs. 5, *h*, 6, *l*). When preparing the border of the hoof for the reception of the shoe, this part is easily distinguished by its lighter colour (in a dark hoof), and by its being softer and more elastic than either the sole or wall, between which it is situated. It would appear to be secreted by the villi which terminate the lower end of the vascular laminæ, and the horny leaves of the wall are also received into its substance—a circumstance that renders the junction of the two more thorough and complete. I think there can be no doubt that the principal use of this elastic rim of horn, placed in such a situation, is to obviate the danger of fracture to which the inferior part of the hoof—particularly the sole—would be liable, if the junction between the hard and comparatively inelastic sole and wall was directly effected without the interposition of such a body.

It may be noted, that it is through this soft border of horn that gravel and foreign matters usually find their way to the sensitive parts of the foot, and there excite such an amount of irritation as to lead to the formation of matter, and cause much pain and lameness; an accident which the older farriers termed "gravelling."

In viewing the horse's hoof as a whole, and in the unshod

state, we find that it presents several salient characteristics, the consideration of which ought to dominate or serve as a guide in framing rules for the observance of farriers in the practice of their art. The first of these is the direction in which the wall grows when it is in a healthy condition.

Viewed as it stands on a level surface, the hoof may be said to be somewhat conical in shape, its upper part being a little less than its base; and although, geometrically, its shape may be described as the frustrum of a cone, the base and summit of which have been cut by two oblique planes—the inferior converging abruptly behind towards the superior—yet the circumference of the hoof does not offer that regularity which this description might imply; on the contrary, in a well-formed foot, we find that the outline of its inferior, or ground border, is notably more salient on the outer than the inner side, giving it that appearance which has been designated the "spread."

A cone being intersected by two planes oblique to its axis, and not parallel to each other, gives a good idea, nevertheless, of the obliquity which forms so marked a feature in the hoof. The degree of obliquity of the front part or "toe," and of the upper surface, varies with the amount of growth; but where this has been counterbalanced by a proper degree of wear, it will be remarked that this obliquity corresponds to the inclination of the pastern bones immediately above the hoof, when the horse is standing.

It will be obvious that this inclination also varies with the breeding of the animal, and the conformation of the limbs;

so that no definite degree can be assigned. But it must be pointed out, that giving the angle of 45°, as is done in almost every treatise on shoeing and the anatomy of the foot, is a grave error. Looked at in profile, a hoof with this degree of obliquity would at once be pronounced a deformity—the slope is too great (fig. 7); and if the farrier were to attempt to bring every foot he shod to this standard, he would inflict serious injury, not only on the foot itself, but also on the back tendons and the joints of the limbs. Careful measurement will prove that the obliquity of the front of the hoof is rarely, if ever, in a well-shaped leg and foot, above 50°, and that it is, in the great majority of cases, nearer 56°. The sides or "quarters" of the wall are less inclined—though the outer is generally more so than the inner; while the heels are

Fig. 7.

Side view of a Hoof which is too Oblique.

still more vertical, and the inner may even incline slightly inwards. Viewed in profile, the posterior face of the hoof will be observed to have the same degree of slope as the front face. In height, the heels are usually a little more than one-half that of the toe; both heels are, or should be, equal in height.

These features, as will be seen hereafter, are of sufficient con-

sequence to be constantly remembered. The other characteristics are to be found on the lower or ground face of the hoof —the most important, so far as the farrier's art is concerned.

In a natural condition, the whole, or nearly the whole of this face comes into contact with the ground, each part participating more or less in sustaining the weight thrown upon the limb. On soft or uneven soil, the entire lower border of the wall, and the sole bars, and frog, are subjected to contact; nature intended them to meet the ground, and there to sustain the animal's weight, as well as the force of his impelling powers. But on hard or rocky land with a level surface, only the dense tough crust and bars, the thick portion of the sole surrounded by them, and the elastic retentive frog meet the force of the weight and movement; and in both cases, not only with impunity, but with advantage to the interior of the foot, as well as the whole limb. The horn on this face is, as has been said, dense, tough, and springy to a degree varying with the parts of which it is composed; while its fibres are not only admirably disposed to support weight, secure a firm grasp of the ground, and aid the movements of the limbs, but are also an excellent medium for modifying concussion or jar to the sensitive and vascular structure in their vicinity.

The whole circumference of the wall meets the ground, and from the disposition of its fibres, the arrangement of the cells which enter into their composition, and its rigidity, it is admirably fitted to resist wear and sustain pressure. It projects more or less beyond the level of the sole, and the space measured between the white zone within it, and its

outer surface, gives its exact thickness. This is a fact not without interest to the farrier in the operation of attaching the shoe by nails, as these have to be driven only through this dense horn—which in good hoofs cannot be said to much exceed half-an-inch in thickness—and in proportion to its thinness is the necessity for carefulness and address on his part, in order to guard against wounding or bruising the sensitive textures.

The sole is more or less concave from its junction with the wall; nevertheless, even on moderately firm ground, a portion of its circumference—which is generally the thickness of the wall—takes a share in relieving the latter of pressure. This is also a fact to be borne in mind. In soft ground, the whole of the lower surface of the sole is made to aid in sustaining the weight, and to prevent the foot sinking. But it must be noted that the pressure of the lower face of the pedal bone or hoof-bone on the upper surface of the sole can never be very great, else the sensitive membrane between them would be seriously injured. This injury is prevented by the coronary and, to a lesser extent, by the plantar cushion, which largely retard the descent of the bone on the floor of the horny box.

The frog, on both hard and soft ground, is an essential portion of the weight-bearing surface. In the unshod, healthy foot it always projects above the level of the sole, and seldom below that of the wall at the heels; indeed, it is found, in the majority of hoofs, either on a level with the circumference of this part, or standing above it, so that its contact with the ground is assured. Hence its utility in obviating concussion, supporting the tendons, and, on slippery ground, in preventing falls. In

pulling up a horse sharply in the gallop, or in descending a steep hill, the frog, together with the angular recess formed by the bar and wall at the heel of the hoof, are eminently serviceable in checking the tendency to slip; the animal instinctively and forcibly plants the posterior portions of the foot exclusively on the ground.

Dark hoofs are generally the best; they owe their colour to the presence of minute particles of black pigment, which contains a notable proportion of iron, and are somewhat resisting and indestructible.

A good hoof should have the wall unbroken, its outer face smooth and even, and the angle at the front not less than 50°; the lower or ground face of the front hoof should be nearly circular in outline,—the sole slightly concave at the circumference, deeper at the centre; the border of the wall ought to be thick at the toe, gradually thinning towards the heels, but at the inflexion or commencement of the bar a strong mass of horn should be found; the bars should be free from fracture, and the frog moderately developed, firm and solid, the middle lacuna or cleft being rather shallow than deep, and showing no trace of pulpiness or discharge.

The hind foot should possess the same soundness of horn, though it differs from the fore hoof in being more oval in outline from the toe to the heels; the sole is also more concave, the frog smaller, and the heels not so high. The horn is usually less hard and resisting—a circumstance perhaps due to the hind feet being more frequently exposed to humidity in the stable than the fore ones.

GROWTH OF THE HOOF.

In any treatise on shoeing, the *growth* of the hoof cannot be left out of consideration; as on it the foot, in an unshod condition, depends for an efficient protection, while without this process the farrier's art would quickly be of no avail.

In its unshod state, the hoof being exposed to continual wear on its lower surface, from contact with the ground on which the animal stands or moves, is unceasingly regenerated by the living parts or tissues within. We have already referred to the special apparatus which is more immediately concerned in this work of regeneration, and pointed out that the wall, with the laminæ on its inner face,* is formed from the coronary cushion at the upper part of the foot; the sole from the living membrane covering the lower face of the pedal bone; and the frog from the plantar cushion. It has been also mentioned that this dead horny envelope, instead of being merely in juxtaposition or simple contact with this exquisitely sensitive secretory membrane, is everywhere penetrated to a certain depth on its inner face (with the exception of the portion of the wall covered with the horny leaves) by multitudes of minute processes named "villi," which are not only concerned in the growth of the horn-fibres—acting as moulds for them,

* It is generally stated that the horny leaves are formed by the sensitive ones, with which they are in such close union. That this is an error, the microscope, physiology, and pathological experience abundantly testify.

and endowing the hoof with that degree of lightness, elasticity, and toughness which are so necessary to its efficiency—but also make this insensitive case a most useful organ of touch.

The growth of the horn takes place by the deposition of new material from the secreting surface; this deposition is effected at the commencement or root of the fibres, on the inner face of the hoof; there the horn is yet soft, and its incessant reproduction causes these fibres to be mechanically extended, or pushed downwards towards the ground in a mass. Once formed, the fibres are submitted to no other change than that of becoming denser, harder, less elastic, and drier, as they recede farther from the surface from which they originated.

So regular is this growth, generally, in every part of the hoof, that it would appear that the secreting membrane is endowed with an equal activity throughout.

But though this equality in the amount of horn secreted over so wide a surface is an undoubted fact, yet it must not be forgotten that, under the influence of certain conditions, the growth or descent of the corneous material may be effected in an irregular manner, either through a particular portion of the secretory apparatus assuming a more energetic activity, or from its being hindered more or less in its function.

For instance, the way in which the foot is placed on the ground has a most marked influence, not only on the amount of horn secreted, but also on that subjected to wear.

When the superincumbent weight of the body and limb is equally distributed over the lower face of the hoof, the

foot may be said to be properly placed as a basis of support to the whole. But when, through mismanagement or defective form, this base is uneven—one side higher than the other, for example—the weight must fall on the lowest part to a greater degree than the highest; thus causing not only disturbance in the direction of the limb and its movements, but considerably modifying the growth of the horn. This growth is diminished at the part subjected to most pressure—in all probability from the smaller quantity of blood allowed to be circulated through the secretory surface; while to the side which is subjected to the least compression, the blood is abundantly supplied, and the formation of horn is consequently augmented. This is a fact of much importance and practical interest in farriery, as it demonstrates that any irregularity in the distribution of the weight of the body on the foot has a prejudicial effect on the secreting apparatus of the organ, and, as a result, on the form of the hoof.

When the weight is evenly imposed on the foot, this apparatus, being uniformly compressed throughout its extent, receives everywhere an equal quantity of the horn-producing material, by the regular flow of blood through it.

It is the same with the *wear* of the hoof. A just disposition of the weight is a necessary condition of the regularity of wear. While the animal is standing on unshod hoofs, the wear of horn is slight; it is in movement that it becomes increased, and this increase is generally in proportion to the speed, the weight carried, the nature of the ground, and whether its surface be wet or dry. Each portion of the lower face of the hoof—wall, sole,

bars, and frog—should take its share of wear and strain; but it will be readily understood that this cannot be properly effected if the weight is thrown more upon one side than the other; that part which receives the largest share will be subjected to the greatest amount of loss from wear, and this, with the diminished secretion of horn, will tend to distort foot and limb still more.

In a well-formed leg and foot, the degrees of resistance of the different parts of the hoof are so well apportioned to the amount of wear to be sustained, that all are equally reduced by contact with the ground, and the whole is maintained in a perfect condition as regards growth and wear.

The amount of growth, even in a well-proportioned hoof, varies considerably in different animals, according to the activity prevailing in, or the development of, the secreting apparatus; and in this respect the operations of the farrier, as we will notice hereafter, are not without much influence.

It may be laid down as a rule, that the horn grows more rapidly in warm dry climates, than in cold wet ones; in healthy energetic animals, than in those which are soft and weakly; during exercise, than in repose; in young, than in old animals. Food, labour, and shoeing also add their influence; while the seasons are to some extent concerned in the growth and shape of the hoof. In winter it widens, becomes softer, and grows but little; in summer it is condensed, becomes more rigid, concave, and resisting, is exposed to severer wear, and grows more rapidly: this variation in quality being a provision of nature to enable the hoof to adapt itself to the altered conditions it

has to meet—hard horn to hard ground, soft horn to soft ground.

In this way we can account for the influence of locality upon the shape of the foot. On hard dry ground, the hoof is dense, tenacious, and somewhat small, with a concave sole, and a little, but firm frog; while in marshy regions it is large and spreading, the horn is soft and easily destroyed by wear, the sole is thin and flat, and the frog is only an immense spongy mass which is badly fitted to receive pressure from even slightly hardened soil. In a dry climate, we have an animal small, compact, wiry and vigorous, travelling on a surface which demands a tenacious hoof, and not one adapted to prevent sinking; in the marshy region we have a large, heavy, lymphatic creature, one of whose primary requirements is a wide flat foot to enable it to travel on a soft yielding surface. Change the respective situations of these two horses, and nature immediately begins to transform them and their feet. The light, excitable, vigorous horse, with its small vertical hoofs and concave soles—so admirably disposed to traverse rocky and slippery surfaces—is physically incompetent to exist on low-lying swamps; while the unwieldy animal, slow-paced and torpid, with a foot perfectly adapted to such a region—its ground face being so extensive and flat that it sinks but little, and the frog developed to such a degree as to resemble a ploughshare in form, which gives it a grip of the soft slippery ground—is but indifferently suited for travelling on a hard rugged surface. In process of time, however, the small concave hoof expands and flattens, and the large flat one gradually becomes concentrated,

hardened, and hollow; these changes being designed to suit the altered physical conditions in which the animals are placed.

The degree of health possessed by the horn-secreting apparatus at any time has also much to do with its activity in generating new material. When its blood-vessels become congested or contracted from some cause or other, its function is in a proportionate degree suspended, and the hoof grows in an irregular manner, and may be altered in thickness, texture, and quality.

In the ordinary conditions of town work and stable management, I have observed that the wall of a healthy foot—its chief portion, so far as farriery is concerned—grows down from the coronet at the rate of about one-fourth of an inch per month, and that the entire wall of a medium-sized hoof is regenerated in from nine to twelve months.

The process of growth can be greatly accelerated and exaggerated, by irritating the surface which throws out the horn material. Thus a blister, hot iron, or any other irritant or stimulant applied to this part, will induce not only a more rapid formation, but one in which increased thickness is a marked feature.

SHOEING.

In the foregoing pages, we have considered the foot of the horse, in a natural condition, as perfectly adapted for the performance of most essential functions: as a basis of support while

the animal is standing, and, in addition, as a powerful propelling instrument during progression.

We have also pointed out that the hoof which envelops it, like a huge finger-nail, is admirably constructed and endowed as an aid and protection to this organ; its utility mainly depending on the texture and arrangement of the horny matter of which it is composed, and the peculiar disposition of this in fibres of variable density, size, and elasticity.

But these qualities of the hoof, it was again remarked, are intimately dependent upon the manner in which the horn-secreting surface performs its office; as if this becomes diminished, weakened, or unable to supply sufficient material to compensate for undue wear, the protecting case soon ceases to guard the living tissues within from injury.

In the natural unshod state, when the equilibrium between growth and wear is destroyed, and the latter takes place in a rapid and unusual manner, the animal is compelled to rest until the worn hoof has recovered its proper thickness; for acute pain results when the living parts are exposed, or when the wasted horn is insufficient to guard them against being bruised by the ground.

In an artificial condition, when the horse is employed on hard roads, broken ground, and in a humid climate, to carry and draw heavy loads at different degrees of velocity, and is forced to stand on stony pavements during resting hours, his hoofs are unable to meet the many severe demands imposed upon them. The wear more than counterbalances the growth; and therefore it becomes an absolute necessity, if the animal is to be con-

tinuously and profitably utilised, that an artificial protection, sufficient to meet the exigencies of the case, be employed.

The lower border of the wall is, as we have mentioned, the part most deeply concerned in resisting wear and strain in the unshod state, as on it the stress chiefly falls; it is, consequently, the portion of the hoof that suffers most severely from undue wear, and that which alone requires protection.

This fact must have been brought prominently before the primitive shoers of horses thousands of years ago, as the earliest specimens of shoes yet discovered are narrow, and in width do not much exceed the thickness of the wall. To guarantee this from wear was to increase the value of the horse a thousand-fold, and the simply-wrought, narrow rim of iron, boldly and securely attached to the hoof by a few rudely-shaped nails, was sufficient for the purpose.

But having fastened on this light metallic armature, and allowed it to remain fixed to the hoof for a lengthened period, it must soon have been discovered that the balance between growth and wear was again disturbed, but this time in favour of growth; for the wall being removed from contact with the ground, and the rate of growth continuing as in the unshod state, the hoof, instead of becoming diminished as before, now became abnormally overgrown, and caused inconvenience. Then the shoe required to be taken off, and the superfluous growth either removed by instruments and the shoe replaced; or the animal was made to travel without the iron defence until it was again needed, perchance when the hoof had become too much worn.

Such was horse-shoeing, in all probability, in early times,

and such it is at the present day, where utility is not sacrificed to stupid theories or foolish practices.

The evils attending the usual methods of shoeing are, as has been said, very serious and glaring; and the chief of these do not so much depend upon the faulty conformation of the shoe—though this is, in the majority of cases, not to be exempted from blame—as upon the treatment the hoof receives before and after the application of that defence.

To illustrate these evils, and to show how unreasonable the modern art of farriery is, as well as to indicate how it should be practised, we will commence with the foot of the unshod colt, and in the simplest words at our command, describe the ordinary procedure in applying shoes to its hoofs for the first time; pointing out, at each step in the process, what is wrong and what is right, and giving reasons for the adoption of the principles which, in our opinion, ought to guide the farrier in this most important operation.

PREPARING THE HOOF.

We will premise that the young horse about to have its hoofs armed for the first time is tolerably docile, and that its tranquillity is not likely to be severely disturbed by the unusual sounds, and the strange manipulations to which its limbs are to be subjected. For many months previously, its attendants should have had this ordeal in view, and in handling it ought

not to have forgotten to manipulate its legs and feet quietly and gently, in something the same fashion that the farrier is likely to do—even going so far in the lesson as to tap lightly on its uplifted hoof, as if nailing on the shoe. The young creature is generally intelligent enough soon to perceive that in this no harm or punishment is intended, and in a short period it becomes familiar with the practice.

The farrier who shoes a young horse for the first or second time, should be a patient, good-tempered man, and an adept in the management of horses and handling their limbs. If the operation is to be performed in a forge, there should be as little noise of hammers or glare of fires as possible—everything ought to be conducted quietly, steadily, and with kindness. Harsh treatment, or unskilful handling, should be severely reprehended, and all restraint or contention ought to be dispensed with—at any rate until gentleness and patience have been diligently employed and have failed. If accustomed to companions, it ought to have one or two horses beside it in the forge, and some one it knows, and in whom it has confidence, should be present to assist in calming its fears and reassuring it.

In describing the construction of the foot, we referred to the shape of a well-formed hoof. We will presume the animal before us—like nearly every unshod horse—has hoofs of this description.

The first step, usually, in the preparation of this part for the shoe, is to level and shorten the lower margin of the wall, pare the sole and frog, and open up the heels. These details may

not be carried out so fully in the first shoeing as subsequently, but we will note them as they are commonly practised during the horse's lifetime.

Levelling the Wall is an important operation, which but few artizans rightly understand or care to do properly. It has been stated that unequal pressure on one side of the foot—one side of the wall being lower than the other—is not only injurious to the whole limb by the undue strain it imposes on the joints and ligaments, but that it tends to deform the hoof and modify the growth of the horn.

It is, therefore, most essential that both sides of the hoof be of equal depth, in addition to the whole lower margin of the wall being level; and to make them so, the rasp should be applied to this border in an oblique manner, across the ends of its fibres, to bring them to the same length.

A good idea of the necessary reduction to be effected on either side will be derived from an inspection of the limb from the knee or hock downwards, when the foot is placed firmly and straight upon the ground. Any deviation of the hoof to the inside or outside—most frequently it is the former—can be readily detected by looking at the leg and hoof in front.

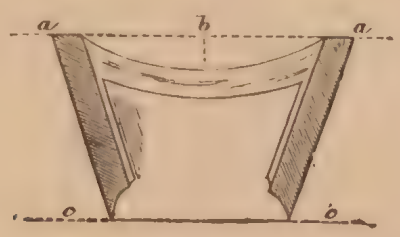
The ground surface of the foot should be directly transverse to the direction of the pastern, and it is in maintaining or restoring this relation that care and skill are required. If the pastern is perpendicular to—that is, in a straight line with—the shank-bone, and the two sides of the lower margin of the foot are directly transverse to the line passing down from these,

then the wall has only to be lowered equally on both sides, if it be too high.

It must be remembered, in levelling both sides of the lower surface of the hoof, that the difference of a few fractions of an inch between them will cause considerable, and perhaps very hurtful, oscillations of the weight thrown on the limb, and especially at the fetlocks.

A properly instructed farrier should be able, at a glance across the upturned foot, to discover whether it is tolerably level. In figure 8, I have shown what is meant by a properly

Fig. 8.



PLAN OF A HOOF to show how it should be levelled at each side, in order to preserve the proper direction of the limb and foot.

levelled hoof, the dotted line *a a*, across the quarters, being directly transverse to the vertical line *b*, and the distance from *a* to *c* of one side being equal to that from *a* to *c* of the other.

Shortening the Wall.—Reducing the wall to proper dimensions is another important matter in connection with the preparation of the foot for the shoe. We have seen that the natural and moderate wear of the unshod hoof is compensated for by the incessant downward growth of the horn, and that this process of wear and regeneration maintains the natural dimensions and just bearing of the foot. But on the application of the shoe a barrier is at once opposed to the wear, while the

growth is not interfered with; consequently, the hoof continually increases in length and obliquity—a change which causes derangement in the disposition of the weight on the lower part of the leg and foot, and other inconveniences.

In speaking of the growth of the horn, it was remarked that in health this took place in a regular manner over the whole surface. It seems rather contradictory, therefore, to assert that the hoof increases in obliquity—appears to grow faster at the toe than the heels—when, if this statement is correct, their increase in length should be always the same. In the unshod hoof this lengthening of the toe is not observed; it only occurs in one that has been shod, and is to be accounted for by the fact that the shoe not being nailed back so far as the heels, is, every time the foot falls on the ground, pressed against the horn at these parts, and so great is this downward friction or pressure, that, after a time, not only is the hoof considerably worn, but the face of the shoe is also deeply channelled at corresponding points. Owing to the shoe being firmly fixed around the toe, there is no play at this part, and hence the apparent inequality in growth between the front and back of the hoof: a circumstance more observable in the fore than the hind foot, from the heels of the former being more under the centre of gravity, and so having a greater weight to sustain.

The pastern and foot form part of a lever that extends from the fetlock to the ground, and supports the weight of the body The strain comes perpendicularly from the shoulder to the fetlock (fig. 9, *a*, *c*); but from thence to the ground it passes

along the pastern and foot (*c*, *d*)—the extremity of the lever—and these are inclined more or less obliquely forward ; hence the charge imposed on the limb has an incessant tendency to increase this obliquity by bringing the fetlock nearer the ground (*b*). To resist this tendency, however, we have the two flexor tendons, and the powerful suspensory ligament at the back of the limb, which support this joint and maintain its angle.

Fig. 9.

Diagram of a Horse's Limb from below the knee, to show the direction in which the weight falls upon it.

But it will be readily understood, that the longer and less upright this lever is, the greater is the strain and fatigue thrown upon the tendons and ligament. Though an oblique pastern may look graceful, and make the horse's step more elastic and agreeable to the rider, yet when the degree of obliquity exceeds that intended by nature, great risk is incurred of injury to the supporting apparatus. Hence the necessity for maintaining the hoof at its normal angle—a

necessity, however, which can never be met, except at the moment when the animal is newly shod; for no sooner is the equilibrium restored between the front and back of the hoof, and the shoe fastened on, than it begins to be disturbed again. This inconvenience is inevitable, from the very nature of the means we adopt to defend the foot from injury.

On the other hand, the suspensory apparatus is less severely taxed, as the lever is short and vertical: or, in other words, as the pastern and hoof are upright. But this, though relieving

Fig. 10.

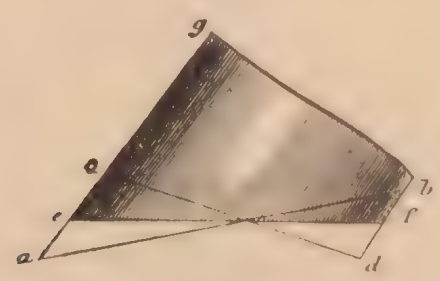


Diagram of the Hoof to exhibit its relative proportions in length and obliquity.

the tendons and ligament, throws the weight too directly on the bones; consequently the jar to these and the whole limb is great, and even dangerous; while the back parts of the foot are unduly strained to relieve them.

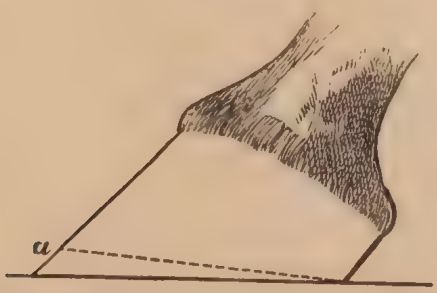
It must be, then, very evident, that levelling and bringing the ground face of the hoof to the necessary length—equal on both sides from toe to heel, and justly proportioned in depth at toe and heel—is no trifling matter, as the soundness of the limb and ease in progression are concerned in the operation. Excessive length or obliquity of hoof strains back tendons and ligament; a hoof long at the toe and low at the heels (fig. 10, *a*, *b*), increases the obliquity; on the contrary, when the heels

are high and the toe of the hoof too short (fig. 10, *c*, *d*), the bones suffer, and the whole limb experiences more or less the effects of concussion.

In both cases progression is fatiguing, imperfect, and hurtful to an extent proportionate to the excess.

Another disadvantage in shoeing, arising from the tendency of the hoof to increase in length at the toe, and also from its form, is the change in the position of the shoe itself. The hoof being more or less conical in shape, with its base opposed to the ground, it follows that, as it increases in length, its lower circumference also widens in every direction; the result is that the

Fig. 11.



A Hoof too oblique reduced to its proper dimensions by the dotted line at *a*.

shoe, although at one time accurately fitting the hoof, gradually becomes too narrow; at the same time the increase in length at the toe carries the iron plate forward, away from the heels.

This is one more of the inevitable evils of shoeing, but one which, nevertheless, the skilful workman may greatly palliate.

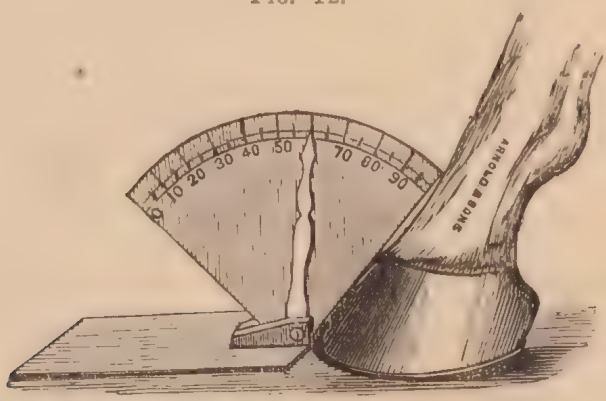
The farrier equalises both sides of the hoof by applying his rasp in a sloping direction to the ground border or end of the wall; he also brings it to its natural angle with the same instrument, by removing the necessary amount of horn from the margin of

the hoof at the toe or heels: by reducing the former without interfering with the latter, the obliquity of the foot is diminished as in figs. 10, *c*, *d*, 11, *a*; while rasping down the heels and leaving the toe untouched increases it (fig. 10, *a*, *b*).

In the great majority of cases, the heels, for the reason stated, require but little interference; the excess of growth is nearly always at the toe, and thus no absolute rule can be laid down as to the angle to which the hoof should be brought. The practised eye can discern at once whether the angle is in conformity with the natural bearing and direction of the limb, and there will be no difficulty in adjusting it, should it not be so, provided there is sufficient horn to spare for this purpose.

We have previously shown that the inclination of the front of the hoof varies from 50° to 60°, and probably the mean between these two angles will be that usually observed. (Fig.

Fig. 12.



Instrument for Measuring the Degree of Obliquity of the Hoof.*

10, *g*, *e*, *f*, is a hoof with about 52° of obliquity; *g*, *a*, *b*, 45°; *g*, *c*, *d*, more than 60°).

* The proportion between foot and instrument is not correct in this drawing. The instrument does not stand higher than the coronet of a large-sized foot.

On ordinary occasions, causing the horse to stand on a level floor, and viewing the hoof in profile a few paces off, is sufficient to inform one of the angle; but to ensure attention to this matter and prevent mistakes, I have contrived a little instrument for my farriers, which at once shows them the degree of obliquity, and gives them an indication as to the amount of horn to be removed from the toe or heels.

This instrument being placed on the ground, the straight border of the index plate is placed parallel with the face of the wall, the obliquity of which is then indicated by the vertical pointer on the upper or convex circumference of the plate, this being marked off in degrees (from 90° to 0°). I have found this instrument very useful in enabling me to give directions to farriers as to the proper amount of horn to be removed from the toe and heels at each shoeing. When it is once known what the natural obliquity of the hoof is, the shoer can then be told to preserve that degree at each shoeing, and the indicator will ensure this being done with accuracy.

In the operation of levelling and shortening the hoof, is included the general reduction of the wall.

Provided the hoof, before it comes into the hands of the farrier, has the proper inclination and is equal on both sides of its ground face, but is nevertheless overgrown, the artizan has then only to remove the excess of growth, without disturbing the relations between the several regions of the wall. Or should the hoof be overgrown, too oblique, too upright, or unequal at the sides, then in remedying the one defect he at the same time remedies all. The amount of horn to be removed from the

margin of the hoof will depend upon circumstances. It may be laid down as a rule, however, that there being but little horn to remove at the heels, these should only be rasped sufficiently to ensure the removal of all loose material incapable of supporting the shoe; the quarters or sides of the hoof may require a freer application of the rasp, but as the toe is reached, a larger quantity must be removed, as in fig. 13, *a*, *b*. The limit to this

Fig. 13.

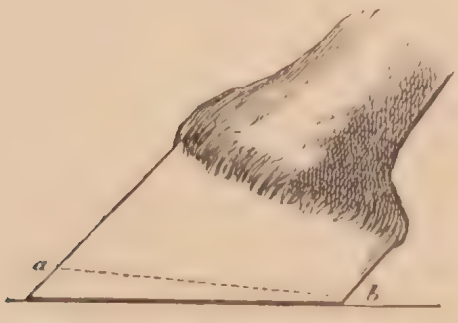


DIAGRAM OF THE HORSE'S FOOT, showing at the dotted line *a b*, the quantity of horn usually required to be removed in the operation of shoeing.

removal at the front of the hoof will be when the wall is almost, or quite, reduced to a level with the strong unpared sole. It must ever be borne in mind that, if the wall does not stand beyond the level of the sole, it does not require reducing.

When the circumference of the hoof has at length been brought to a condition fit to receive the shoe, the rasp must finish its task by removing the sharp edge, and rounding it so as to leave a thick strong border not likely to chip. The unshod hoof nearly always exhibits this provision against fracture of the wall-fibres.

Paring the Sole.—After the necessary diminution and correction of the obliquity of the hoof, and the preparation

of the bed for the shoe, the farrier usually proceeds to pare the sole. Indeed, while the colt is still at large, and before the time has arrived when its hoofs are to be shod with iron, the workman is frequently called in to *trim* the hoofs, and paring the lower surface is part of the operation.

This procedure is as barbarous as it is unreasonable, especially when carried to the extent that has been advised in books on horse-shoeing: viz., to pare the sole until it springs to the pressure of the thumb. In the great majority of forges this most pernicious practice is carried out, either because the owner of the horse thinks it necessary, the groom or coachman that it makes the horse go better and the feet to look well, or the farrier that it is more workmanlike—though if he is pressed hard for any other reason he is unable to give one of a satisfactory character.

Like so many practices relating to the management of the horse, this paring of the sole is absurd in the extreme, and has not the most trifling recommendation to support it. Unfortunately for those who recommend, and also those who practise it, its evil effects are not immediately apparent; a horse with his soles denuded of their horn until the blood is oozing through them, may not at the moment manifest any great suffering, and may even go tolerably sound on a level pavement, though if he chance to put his foot on uneven ground or a sharp stone, his agony may be so acute as to cause him to fall.

The paring-knife is skilfully used to remove all the surface horn down to that which has been most recently formed, or is in process of forming. So anxious is the groom or farrier that

this, to them, most important operation should be carried out, that the soles are filled with cow-dung, or some other filth, for some time previously, in order that the horn may be softened and rendered more amenable to mutilation. When this "stopping" has not been carried out, and particularly in hot, dry weather, the sole is often so hard that it cannot be touched by the knife, in which case a red-hot iron is applied to the surface to soften the horn, or hot ashes are used. Then the bars and sole are sliced away, until nothing is left but the thinnest pellicle of the natural protection of the very sensitive parts beneath, and not unfrequently the blood may be seen oozing through in large globules. This is nothing else than downright cruelty, and should meet with the punishment it so well deserves.

To remove the excessive growth of the wall is an absolute necessity; but to denude the sole of its horn is wanton injury to the foot and cruelty to the animal. This is easily accounted for. The sole only increases its substance to a certain thickness —never too much—and then the excess is thrown off in flakes in a natural manner. In this way the sensitive foot within is amply protected; the sole can sustain a share of the weight—especially around its margin in front, where it is strongest—and meet the ground, however rough and stony this may be, with perfect impunity. This is its function.

It has been mentioned that the horn is secreted from the living surface, and that myriads of beautiful vascular and sensitive tufts, dependent from this surface, enter the horn-fibres to a certain depth, and play an important part in the

formation of the sole. The newly-formed horn is soft and spongy, and incapable of resisting exposure to the air; but as it is pushed further away from this surface by successive deposits of fresh material, it becomes old horn, loses its moisture, and in doing so acquires the hardness and rigidity necessary to enable it to withstand external influences; then it is subjected to wear, and if this be insufficient to reduce it sufficiently, it falls off in scales. But the process of exfoliation is not a rapid one; the flakes remain more or less firmly attached to the solid horn beneath, until it in turn commences to loosen on the surface and yield new flakes, when the old ones entirely separate from it. This natural diminution in the excess of horn of the sole is a most beneficial process for the hoof. Horn is a slow conductor of heat and cold, and when thick, retains moisture for a long period. These flakes, then, act as a natural "stopping" to the hoof, by accumulating and retaining moisture beneath; and this moisture not only keeps the foot cool as it slowly evaporates, but ensures to the solid and growing horn its toughness, elasticity, and proper development. In addition to this, every flake acts more or less as a spring in warding off bruises or other injuries to the sole; and thus the floor of the horny box is thoroughly protected from injury, externally and internally.

What occurs when the farrier, following out the routine of his craft, or obeying the injunctions of those as ignorant as himself, or so prejudiced as not to be able to reason, pares the sole until it springs to the pressure of his thumb? Why, the lower surface of the foot—that which is destined to come into contact with the ground, and to encounter its inequalities and

asperities, and which more than any other part requires to be efficiently shielded—is at once ruthlessly denuded of its protection, and exposed to the most serious injury. The immature horn, suddenly robbed of its outer covering, immediately begins to experience the evil effects of external influences; it loses its moisture, dries, hardens, and shrivels up; it also occupies a smaller space, and in doing so, the sole becomes more concave, drawing after it the wall—for it must be remembered that the sole is a strong stay against contraction of the lower margin of the hoof; and the consequence is, that the foot gradually decreases in size, and the quarters and heels become narrow. The animal goes "tender," even on smooth ground; but if he chance to put his mutilated sole on a stone, what pain must he experience!

This tenderness on even ground or smoothly-paved roads, arises from the fact, that not only is the entire sensitive surface compressed, irritated, or inflamed by the hard, contracting envelope, and the unnatural exposure to sudden changes of heat and cold; but that the little sensitive processes contained at the upper end of each of the horn-fibres are painfully crushed in their greatly diminished tubes, and instead of being organs of secretion and the most delicate touch, they are now scarcely more than instruments of torture to the unfortunate animal. Not only is pain or uneasiness experienced during progression, but even in the stable the horse whose soles have been so barbarously treated, exhibits tenderness in his feet by resting them alternately, and if they are felt a great increase of temperature will be perceived.

Owing to the secreting apparatus of the sole being deranged through this senseless paring, the formation of new horn takes place slowly, and it is not until a certain quantity has been provided to compensate in some degree for that removed, that the horse begins to stand easier, and travel better. Scarcely, however, has the restorative process advanced to this stage, than it is time for him to be re-shod, when this part must again submit to be robbed of its horn.

The sole having been pared too thin and made very concave, leaves the circumference of the hoof standing much higher than if the former had been left intact, and apparently too long; so the wall must be still more reduced. This is done; and we now have the whole ground-face of the hoof so wasted and mutilated, that should the horse chance to lose a shoe soon after being shod, the impoverished foot cannot bear the rude contact of the ground for more than a few yards, and the poor creature is lame and useless.

The tenderness and lameness arising from this maltreatment are usually ascribed to everything but the right cause, and the most popular is concussion. To avert this and protect the defenceless sole, a most absurd shoe is required; and, still more absurd, the natural covering is attempted to be replaced by a plate of leather, interposed between the ground and the sole, and which is made to retain bundles of tow steeped in tar, or some pernicious substance. It is scarcely necessary to say that this artificial covering is but a poor substitute for that which has been so foolishly, and with so much careful labour, cut away; indeed, in several respects the leather sole, even

when only placed between the wall and shoe, and not over the entire surface, is very objectionable.

Seeing, therefore, the natural provision existing in the sole of the hoof for its diminution in thickness, when necessary, and knowing that the intact sole is the best safeguard against injury and deterioration to this region, it must be laid down as a rule in farriery,—and a rule from which there must be no departure —that this part is not to be interfered with on any pretence, so long as the foot is in health; not even the flakes are to be disturbed.

By adhering to this rule, the horse can travel safely and with ease in all weathers, and over any roads, immediately after shoeing; the foot is maintained in a healthy condition; the sole can sustain its share of the weight, and thus relieve the wall of the hoof; and should a shoe happen to be lost, the animal can journey a long distance with but little injury to the organ.

Another of the many advantages derived from allowing the sole to remain in its natural condition, is that on a soft surface the hoof will not sink so deeply as one whose sole has been hollowed out by the farrier; neither is it so difficult to withdraw from heavy soil.

Paring the Frog.—This part of the hoof is that which, in the opinion of the grooms and coachmen, and some others who should know better, most requires *cutting*, "to prevent its coming on the ground and laming the horse;" and this reason, together with its softer texture, causes it to be made the special sport of the farrier's relentless knife. It is artis-

tically and thoroughly trimmed, the fine elastic horn being sliced away, sometimes even to the quick, and in its sadly reduced form it undergoes the same changes as have been observed in the pared sole. No wonder, then, that it cannot bear touching the ground any more than the sole. Strip the skin off the sole of a man's foot, and cause him to travel over stony or pebbly roads! Would he walk comfortably and soundly? How would the elephant, the camel, or even the dog travel, if we pared away the pads on the bottom of their feet? Would we not be committing a very stupid—nay, a very cruel act, by doing so. And yet the horse's frog performs the same important function that the pad does on their foot.

The artistically-shaped frog, so treated, soon wastes, becomes diseased, and at length appears as a ragged, foul-smelling shred of horn, almost imperceptible between the narrow deformed heels of the pared foot.

The function of the frog in the animal economy is one of great moment, and has already been indicated. It is eminently adapted for contact with the ground, and in this resides its most important office. To remove it from the ground and deprive it of its horn, is at once to destroy its utility and its structure, and withdraw from the foot one of its most essential components. The longer the frog is left untouched by the knife, and allowed to meet the ground, the more developed it becomes; its horn grows so dense and resisting, yet without losing its special properties, that it braves the crushing of the roughest roads without suffering in the slightest degree; it

ensures the hoof retaining its proper shape at the heels; is a valuable supporter of the limb and foot while the animal is standing or moving; and is an active agent, from its shape and texture, in preventing slipping. Its reduction and removal from the ground, I am perfectly convinced from long observation, have a tendency, directly or indirectly, to induce that most painful, frequent, and incurable malady—navicular disease, as well as other affections of this organ.

The farrier should, therefore, leave the frog also untouched, unless there be flakes which are useless—though this is extremely rare; then these ought to be cut off. So particular am I in this respect, however, and so well aware am I of the morbid desire of the workman to cut into this part, that I never allow any frogs to be interfered with unless I am present. If any gravel has lodged beneath the flakes, at the side, or in the cleft—which is most unfrequent—this is removed by some blunt instrument.

To show the value of contact with the ground: when a horse with a diseased frog is brought to me, I at once order the hoof to be so prepared or shod that this part will immediately receive direct pressure—in a brief space the disease disappears. Cases of what grooms call "thrush," of many years' duration, and which had defied all kinds of favourite dressings, have been cured, and the rotten, wasted frogs have become sound and well developed in a few months.

Opening-up the Heels.—Having done everything possible to ruin the sole and the frog, the farrier proceeds to complete his work by opening-up the heels. This operation is quite as in-

jurious — if it is not more so — than mutilating the other parts; it consists in making a deep cut into the angle of the wall at the heel, where it becomes bent inwards to form the bar. In the unshod, natural state, or in the unmutilated foot, this is a particularly strong portion of the hoof, and serves a very useful purpose, its utility being mainly owing to its strength. From its preventing contraction of the heels, it has been named the *arc boutant* or, "buttress" of the foot, by the French hippotomists.

When it is hacked away by the farrier's knife, the wall of the hoof is not only considerably weakened, but the hoof gradually contracts towards the heels.

Horse-dealers and grooms are the chief patrons of "well-opened" heels, as they give the foot a false appearance by making it look wider in this region.

The fashion of paring the sole until it yields to the pressure of the thumb has been perpetuated through the ignorance of those who have had the management of horses, or the traditions and routine of the artizans who more especially attend to the requirements of the hoofs of these animals. But it must be observed that this paring, slicing away the frog, and opening up the heels, has been largely due, in later times, to the false notions propounded by some writers regarding the functions of the horse's foot—such as the descent of the sole, the inability of the frog to sustain contact with the ground, and the expansion of the back parts of the hoof every time the weight was imposed upon it. It is scarcely necessary here to say more, than that these notions are at least extremely exaggerated, and

that the practices which were maintained to facilitate these supposed functions have been productive of an immense amount of suffering and loss of animal life.

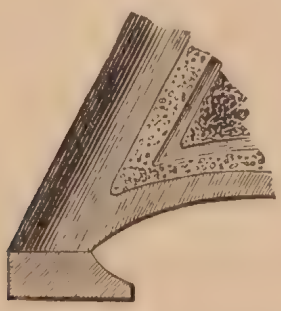
It should be ever most strenuously insisted upon, that the whole lower face of the hoof, except the border of the wall, must be left in a state of nature; the horn of the sole, frog, and bars, has an important duty to fulfil; it is the natural protection to this part of the hoof, and no protection of iron, leather, or other material, is half so efficacious; in addition, it is a capital agent in sustaining weight, and in keeping the whole foot healthy and perfect in form.

THE SHOE.

The Ordinary Shoe.—The hoof having been prepared by the farrier, according to his fancy, for the reception of the metal plate which is to garnish it, here again we find that ignorance prevails and is productive of inconvenience and injury. "Improved principles" demand that a particular-shaped shoe be applied: no matter whether the animal be for saddle, harness, or draught purposes, it must have a shoe that rests only on the margin of the hoof—on the wall. Therefore, except a narrow border to correspond with this margin, the upper or foot-face of the shoe is bevelled away, so as to leave a wide space between it and the sole, and throw all the weight and

strain on the outer parts of the foot (fig. 14), thus inducing a tendency to deformity and impaired movement; in addition to which disadvantage, this space is admirably contrived to lodge stones, gravel, hardened mud, or snow, and in heavy ground it

Fig. 14.



Section of the Front Part of the Horse's Foot and the ordinary shoe, to show the disadvantage of resting the hoof only on the wall.

increases the suction immensely. But, as will be easily understood from the manner in which the under-surface of the foot has been treated, this bevelling is rendered an absolute necessity if the horse is to be preserved from immediate lameness. The sole has been pared so thin, that so far from its being able to withstand a tolerably large amount of pressure around its margin—particularly towards the toe—it must be most carefully preserved not only from contact with the shoe, but also from contact with the ground. This necessitates a wide surface of metal, which increases the weight of the shoe, making it clumsier to wear, and affording a large under or ground-surface for slipping. And even with a shoe of such dimensions the creature cannot travel at ease on stony roads; as the least pressure of a pebble on the tender sole causes him to limp, and

if the stone lodges in the space between shoe and sole serious injury is likely to be inflicted.

Weight.—In addition to the bevelling and the width, the shoe in ordinary use has several other glaring defects. One of these is generally its excessive weight; it contains an amount of iron far greater than is necessary to protect the hoof from the effects of wear. One reason alleged for the employment of these cumbrous masses of iron attached to the lower end of a horse's limbs, is that they prevent concussion to the foot. This, any reasonable person will at once perceive, is a manifest absurdity. The hoof, by its lightness, its texture, and the wonderful arrangement of its component parts, is well adapted to avert concussion; an inelastic heavy lump of iron firmly attached to it, and coming into forcible collision with the ground at every step, must surely be more likely to increase this concussion than diminish it.

There can be no difficulty, I imagine, in estimating the injury inflicted by unnecessarily heavy shoes. Nature formed the lower extremity of the limb with a view to lightness, no less than to other important ends. The hoof-bone is quite porous and open in texture, to diminish its ponderosity, without detracting from its size or stability; while the hoof itself is, as we have just noticed, remarkable for the manner in which its material is arranged with a special intention to confer light-footedness upon the animal. The reason for this diminution in weight, while it is coincident with increase in bulk, is to be found in the fact that the muscles principally concerned in moving the limb — swinging, straightening, and bending it backwards and forwards—are all situated above the knee or

hock. The moving power is at one end of a comparatively long lever with two arms, while the weight to be moved is at the other extremity. The arm of the lever to which the power is applied is very short; so that though rapidity is gained, more power is lost. If we therefore consider the anatomy of the limb in a mechanical point of view, it will be obvious to any ordinary understanding that every additional ounce added to the foot must be nearly, if not more than, equal to a pound at the shoulder.

In shoeing, this important consideration has been strangely overlooked; and yet we cannot forget that it must have a great influence on the wear, not only of the shoe, but also of the muscles, tendons, ligaments, and joints, and even, indirectly, of the entire animal. "If, at the termination of a day's work," says an eminent French veterinary professor, "we calculate the weight represented by the mass of iron in the heavy shoes a horse is condemned to carry at each step, we shall arrive at a formidable array of figures, and in this way be able to estimate the amount of force uselessly expended by the animal in raising the shoes that overload his feet. The calculation I have made possesses an eloquence that dispenses with very long commentaries. Suppose that the weight of a shoe is two pounds, it is not going beyond moderation to admit that a horse trots at the rate of one step every second, or sixty steps a minute. In a minute, then, the limb of a horse whose foot carries two pounds, makes efforts sufficient to raise a weight of one hundred and twenty pounds. For the four limbs this weight in a minute is represented by $120 \times 4 = 480$ pounds; for the four feet during an hour the

weight is 28,800 pounds; and for four hours, the mean duration of a day's work in the French omnibuses, the total amount of weight raised has reached the enormous figure of 115,200 pounds. But the movement communicated to these 115,200 pounds represents an expenditure of the power employed by the motor without any useful result; and as the motor is a living one, this expenditure of strength represents an exhaustion, or, if you like it better, a degree of fatigue proportioned to the effort necessary for its manifestation."

This question of weight is one of no small moment to the well-being and utility of the horse, and therefore demands particular attention. Nature, in constructing the animal machine, and in enduing it with adequate power to sustain the ordinary requirements of organization, and even to meet certain extraordinary demands, could scarcely have been expected to provide the large additional amount of energy necessary to swing several ounces, or even pounds, attached to the lower extremity of the limb. A horse shod with a two-pound shoe to each foot, travelling at the rate of sixty steps in a minute for a period of four hours, as has been stated above, carries nearly fifty-two tons; this weight too, as has been stated, is most disadvantageously placed at the end of the long arm of the lever. It must be remembered, also, that a two-pound shoe is a very moderate affair when compared with many that are worn every day in town and country, even by horses employed in fast work.*

* I have weighed some ordinary-sized, *worn-out* shoes from the feet of draught horses, and found them to weigh from four to six pounds. What must they have weighed when new? And what was the sum total of the muscular power required to carry them for a month? One thinks with dismay of the loss occurring every day in our large cities, through such an apparently trifling circumstance.

Not only does an unnecessarily heavy shoe fatigue and wear out the limbs sooner than a light one, but the lassitude it induces causes it to be less durable, in proportion to the quantity of iron it contains. This is accounted for by the manner in which the wearied limbs drag their cumbrous load along the surface of the ground. Heavy shoes also require more, and larger, nails to attach them securely to the hoof, and this in itself is an evil of no trifling magnitude, as we shall see presently.

The shoe, besides being heavy, may offer other serious defects. It may be very uneven or very narrow on its upper bearing surface — that on which the hoof rests; it may have too many clips, and these not well formed or situated; its ground surface may be unequal; or the holes for the nails may be badly placed, and improperly stamped.

An uneven or narrow upper surface is apt to produce lameness, from the undue pressure it occasions on limited parts of the hoof, and through these to the corresponding living textures; or it may cause the wall of the hoof to split, etc.

Nails badly placed and improperly stamped are a prolific source of injury to the foot, and the same may be said of malformed or wrongly-situated clips; while much evil results from the ground face of the shoe being higher at one part than another. This inequality is, in nearly every case, due to the presence of what are termed "calkins" at the extremities of the branches of the shoe; or to one side of the plate being thicker than the other.

Calkins.—Calkins are injurious to the limb in proportion to their height. When smallest they are an evil, as they have a

tendency, in raising the back part of the foot higher than the front, to alter the natural direction of the limb, and throw undue strain on the fore part. Intended to prevent slipping, their use in this respect is but temporary, unless they are made high and thick: when their unfavourable influence on the limb and foot is increased. Added to this, from their throwing so much of the weight and strain on the front of the foot, the shoe is more rapidly worn away at the toe; so its thickness there must be greater, and the shoe in consequence heavier, or the animal will have to be more frequently shod. From their only lasting for a limited period, the horse, at first inclined to rely on them to preserve his footing on slippery roads, becomes timid and unsafe when they are worn down to the surface of the shoe. By their form, and their projecting so much beyond the level of the plate, they jar the limb; expose it to twists and treads, sometimes of a grave character; induce shortening of the flexor tendons; and until they have been considerably reduced, interfere with the animal's action. They are also liable to cause the shoe to be torn off, by getting caught between paving-stones; while they produce severe lacerations, should the horse wearing them happen to kick another animal. This is more particularly observed among army horses which have calkins on their hind shoes—and especially when in camp or picketed. They also throw more strain upon the nails and the hoof itself. Neither must it be forgotten that they remove the frog from contact with the ground.

One side of the shoe being higher than the other produces the same results as follow when the hoof is unequal in this

respect. The hind limb is more exposed to this evil than the fore one, from calkins being most frequently added to the hind shoes, and from the fashion of having the inner branch thickened, but not sufficient to compensate for the height of the calkin on the outer heel. This inequality is productive of injury to the fetlock and hock joint, and is doubtless not unfrequently the cause of that formidable disease of the latter—"spavin."

But even if the farrier has reason to apply shoes, the ground surface of which is not studded with calkins or any other kind of "catch," he, in nearly every case of ordinary wear, puts on one which has the whole of this surface perfectly plane, and not relieved throughout its length or width by anything, except perhaps the groove (or "fullering") around its outer circumference, in which the nail-holes are placed. This wide smooth surface is evidently adapted to facilitate slipping on smooth pavements, or even on grass or clay land. No better device, in fact, could be proposed to promote insecurity of foot-hold than this plane, wide-surfaced shoe, such as we so frequently see it in the streets of London.

Size.—Besides constructing the shoe of a faulty shape, a very common practice is to apply one smaller than the actual outline of the ground surface of the hoof. This is a grave error, and in all probability arises from the desire to make the horse's foot look small and neat, and to produce fine work; just as the maker of shoes for the human foot thinks it the perfection of workmanship to squeeze it into the smallest possible, and most unnatural looking, space. In the horse, however, small shoes are more fruitful of lameness and chronic deformity than even the

worst-shaped cramped coverings can be for the human extremity; as the horse is compelled to wear his tight plates day and night, and must accomplish all kinds of severe labour in them; while man can relieve himself of his torturing uncomfortable boots for at least some hours out of the twenty-four.

We shall allude to the evils of this stupid practice hereafter; in the meantime, it may be sufficient to point out, that in selecting and applying a shoe smaller than the circumference of the hoof, we are depriving the foot and limb of a portion of their stability and weight-bearing surface. The limb is, in reality, a column of support for the body, and the hoof is the base of this column. This base is very much wider than any other portion, and only commences at the foot, which gradually widens towards the ground, so as to make it still more expanded and efficient. To diminish this base is to frustrate Nature's mode of affording security and ease to the limb, and consequently to do it harm and impair its stability.

The above are only some of the more prominent evils attendant on the present method of constructing and shaping the horse's shoe; others, such as making it of bad material, altogether unlike the outline of the hoof, etc., we will glance at presently. We need not stop to consider what has been, for very many years, the aim of those who, overlooking the real injury done to the foot by the barbarous fashion of paring and rasping, imagined the chief, if not the sole, cause of lameness and inefficiency arose from the faulty character of the protection applied to it, and have sought to avert these by devising various kinds of shoes, or other methods of arming the hoof.

It is scarcely necessary to say, that from their neglecting, or being unconscious of the harm that resulted from the malpractices already indicated, their so-called improvements have been impotent for good, and have soon been consigned to forgetfulness.

Objects to be Attained.—We have stated what we imagined were the objects sought to be attained when shoeing was first introduced. To prevent undue wear of the horn, and at the same time to secure a good foothold for the horse, appear to have been all that was considered essential in the infancy of the art of farriery. And it must be conceded that, even now, these are the primary advantages to be achieved in constructing a horse-shoe, no matter what kind of task the horse that wears it may be required to accomplish.

There can scarcely be a doubt that anything more simple and efficient, and at the same time less expensive, than a well-devised iron-shoe, cannot at present be produced; nor can the comparatively safe and ready method of attaching it by nails be superseded by any other means that we are acquainted with. All tentatives in this direction have failed, either because of their inefficiency or greater expense.

Simplicity, cheapness, durability, and perfect adaptability to various requirements, are the essentials to be obtained in horse-shoes; and if one or more of these is absent in any particular pattern, it can never be generally adopted, and is certain to have but brief success.

The effects of applying an iron defence to the horse's foot, and securing it to the hoof by means of nails, are no doubt a

source of injury to that organ, and even with every care a few of these effects are unavoidable; but they are increased in number and heightened in intensity when the shoe is badly constructed and attached; whereas, by the exercise of a little common sense and observation, those which are not to be avoided may be greatly mitigated.

The foot, as has been observed, is a perfect organ, formed, in harmony with the other parts of the limb, to meet every requirement in bearing weight and aiding movement.

The hoof, as an integral portion of the foot, possesses these qualities to a high degree, and, but for its inability to withstand incessant wear, would need no assistance from man, except perhaps a little trimming when it became overgrown or irregular. Its lower margin—hard, narrow, and projecting slightly beyond the sole—is well adapted to support weight, withstand wear, and retain a hold of the ground; the concave sole, in addition to its assisting the margin to support weight and endure wear, also lends its aid in securing a foothold by its hollow surface; while the angle of the wall at each heel—the "buttress"—would appear to be specially designed to afford a most effective check to the sliding forward of the foot as the animal suddenly pulls up when moving at a fast pace on level ground, or attempts to stop or diminish his descent on a slippery declivity.

Those who study the functions of the animal body, and who have to restore these when deranged, well know that in their attempts to keep them in a normal condition, or to bring them back to a healthy state, they must attend to the laws which

govern these functions, and must follow the indications of Nature. Therefore I have asked myself if it is possible to construct a shoe which, while cheaply and easily manufactured by any ordinary farrier, will answer the same ends as the lower surface of the foot does in a natural state; at the same time protecting and supporting it, without interfering to any appreciable extent with the healthy functions of the organ. We have seen that the ordinary shoe is extremely imperfect, if it is not diametrically opposite to what we should consider as calculated to protect the foot, secure a good foothold, and interfere but little with its functions. Instead of supporting the sole at its strongest part, and thus relieving the wall from much of the strain, it rests on the wall alone; this is contrary to natural indications. The wide space between sole and shoe affords lodgment to foreign bodies which, when the sole is artistically mutilated, may do grievous harm, and it also increases suction in soft ground; the hoof shows nothing of this kind. Then, again, the ground face of the shoe is a wide and smooth plane which, instead of preventing slipping, conduces to it; or thickened portions project above this face, which disturb the balance and injure the limb, while they are only of very temporary and questionable service in ensuring a firm footing.

In the unshod hoof we see nothing of this, and we are brought to the conclusion, which daily experience amply confirms, that in addition to the ordinary management of the hoof being utterly erroneous, the shoe usually applied to it is very far from what it ought to be.

Pattern of Shoe recommended.—If the sole of the hoof has

not been mutilated by the knife, it does not require to be covered by the shoe, as Nature has furnished an infinitely better protection. Wide-surfaced shoes can therefore be at once dispensed with, and a narrow shoe, made of the very best and toughest iron, adapted for travelling on slippery roads, capable of aiding foot and limb, and sufficient to withstand wear for four or five weeks, is all that is required. We will therefore conclude that the upper or foot surface should be the whole width of the shoe, and that it should be plane—not bevelled; for we have seen that the sole was destined, particularly at its junction with the wall in front, to sustain weight. We also know that it is advantageous to the whole foot and limb to allow the sole as wide and general a bearing as possible; so that one part may relieve the other—the sole coming to the aid of the wall, and the frog interposing to share the fatigue imposed upon both, as well as to relieve the strain on the hinder parts of the foot, flexor tendons and limb, and keep a firm grasp of the ground by its elastic and adhesive properties.

The shoe applied to the foot, then, should have its hoof surface flat, in order that it may sustain the wall and as much of this strong portion of the sole as its width permits. This is contrary to the usual practice, which only allows the wall to rest on a narrow surface, and bevels off the remainder of the shoe to prevent contact with the sole. Many years' experience of this *plane foot-surfaced shoe* in various regions of the globe, and on feet of every kind and quality, have proved the soundness of this view. The foot is brought as near to a state of nature when the greater part of its plantar surface supports

the weight of the body, as man can hope to achieve while submitting the horse to an artificial existence.

A light thin shoe is always preferable to a heavy thick one; as the narrowness of the metal insures a good foothold —in this respect imitating the wall; while its thinness brings the sole, frog, and bars in closer approximation to the ground.

It is impossible to devise a shoe that will successfully meet every requirement. The heavy draught horse, doomed to bring into play every muscle in endeavouring to move and drag along an enormous load, must have his feet differently armed to the hunter or race-horse, with which speed is the chief requisite. Taking into account the different character of the horny textures, it is none the less true, however, that the same rule holds good in all with regard to the sole and frog sustaining weight, though in the slow-moving animal it is of less importance, perhaps, than in the lighter and more fleet one. The massive draught horse requires toe and heel projections or "catches" on the ground surface of the shoes, to economise his locomotive powers and to aid his powerful efforts; though his hoofs none the less require the observance of those conservative principles which have been so strongly insisted upon, but which are so very seldom applied.

It is quite unaccountable why, in London, the shoes for draught horses should be so badly constructed. Generally, if not altogether, of the faulty type we have been describing, their ground-surface is either quite flat and smooth, or the ends of the branches are merely thickened or raised into calkins. Con-

sequently, the foothold is most insecure, and, in starting or drawing heavy loads, the animal receives no assistance from its shoes; on the contrary, but for the damage it would cause to the hoofs, the horse would be more efficient without shoes. It is painful to witness the insecurity and difficulty horses experience in drawing a very moderate load in the streets of London, and to consider what a trifling amount of common sense on the part of their owners would add immensely to the comfort and utility of their timid and only half-efficient slaves.

Fig. 15.

Foot of a Draught Horse Shod with Toe-and-Heel-Catch Shoe.

Contrast what horses can do in the way of draught in any town or city of the north of England—as in Manchester or Liverpool—with the little they do in London, and say if the horse-owners of the Metropolis are alive to their own interests, or the comfort of their four-footed servants in this matter.

It must be remembered that calkins are chiefly useful when

the horse is "backing" a load; the toe, and particularly that of the hind foot, is the part on which the animal relies to start and carry the waggon forward. Therefore, in addition to the calkins or heel-projections, there should be a toe-piece of the same height as the latter, extending across the ground-surface of the front part of the shoe (fig. 15). This addition to the shoe need not increase its weight; indeed, it should enable the farrier to dispense with the great clumsy masses of iron now in use, and which are a mere waste of material, horse-power, and horse-life.*

To give the greatest amount of strength and foothold to the shoes of the heavy draught horse, with the least amount of weight, should, therefore, be an object always kept in view in making them. But, with this animal, another principal

* It is not in the matter of horse-shoes alone that London horse-proprietors are behind those of many of the provincial towns. The omnibuses are worthy of two centuries ago. Uncomfortable and inconvenient in the extreme for the passengers they carry, they are still more so for the unfortunate horses which are harnessed to them. There is a total absence of those indications of thoughtfulness for the ease or welfare of the teams, which we see in nearly all other towns and cities. Those apparently trifling appliances which add so much to the value and usefulness of the horse, and which relieve him of a great deal that is onerous and fatiguing in his labour, might have no existence whatever, so far as the Metropolitan omnibus owner is concerned. The simple foot-brake, which eases the horses so much in their incessant pullings-up, has no place in the City 'bus; and nothing, I think, can look more cruel, improvident, and behind the age, than to see the poor horses of a heavily-laden carriage carried along, almost on their haunches, for some yards on the slippery streets before they can bring their load to a stand-still, the driver at the same time straining his arms and tearing at the unlucky brutes' mouths. It is intolerable that such a state of things should exist, when, by a simple and inexpensive apparatus, horses and drivers would be greatly relieved, and the public benefited. It looks so much like wanton cruelty, that I fancy magistrates would not have much difficulty in making up their minds to a conviction of the offenders. At any rate, the Royal Society for the Prevention of Cruelty to Animals might do worse than give this discreditable treatment of horses its attention.

object is the preservation of the wall of the hoof, in order that it may remain sound and strong for the retention of the nails; to assist in effecting this, the sole and frog must be preserved intact.

The form of the shoe in all cases should, in outline, resemble the shape of the ground surface of the hoof. It has been decided that its upper surface must be flat from the outer to the inner margin. For horses other than those of heavy draught, its width will of course vary; but it is an advantage to have it as narrow as is compatible, in relation to its thickness, with the amount of wear required from it.

The ground face of the shoe for other than draught horses is the next point for consideration. This should always be, if possible, parallel with its upper face: that is, the shoe ought to be plane on both surfaces, and of the same thickness on both sides, not only in the fore, but also the hind shoes. This guarantees the foot and limb being kept in a natural position. What are termed "calkins" on one or both heels are very objectionable, for the simple reason that, as has been stated, they raise the back part of the foot higher than the front, and throw the limb forward; unless the hoof meets the ground in its natural direction, some portion of the leg or foot will be certain to suffer. Therefore whatever device may be employed to prevent slipping and secure a hold of the ground, should not interfere with the natural direction of the limb or foot. If calkins are deemed necessary, then the front part of the shoe ought to be raised to a corresponding height, either by thickening its substance, or by adding a toe-piece. In

the majority of cases, however, the benefit derived from these projections is problematical; and it is certain that hundreds of horses travel as safely without them as with them. In many of our large towns and cities they are but little employed, and with advantage to the legs and feet. For many years I have not allowed a calkin to be worn on the shoes of any of the horses in my charge, and no complaints of slipping or insecure footing have ever been made; nor have any reports of horses falling down either on slippery turf or the smooth surface of paved streets, from the absence of calkins, ever reached me. Having studied the subject of farriery practically, for several years, in the large cities of Glasgow and Manchester before entering the army, and having during eighteen years' service been attached to those branches in which light or riding horses, and heavy or draught horses, are employed, my opportunities for observation have been somewhat extensive. These opportunities have led me to form the opinion just given as to the value of calkins. While stationed with my regiment in Edinburgh in 1864-5, I obtained permission to dispense with calkins on the hind shoes (they are not worn on the fore shoes of cavalry horses), and though the orderly and other duties were somewhat heavy on the streets of that city—which are perhaps the most slippery in Britain—no accident occurred.

For more than three years I have been stationed in a large garrison town in the south of England, with nearly three hundred horses—most of which are draught—in my charge. The greater portion of these animals are employed several hours every day, conveying heavy loads up and down very badly made

and excessively steep roads; no calkins or toe-pieces are worn, no slipping is ever observed, while the sprains and injuries arising from the use of calkins are unknown.

This immunity I attribute not alone to the absence of these projections, but to the care always taken to keep the hoofs healthy, properly adjusted, and strong, with the frogs resting as much as possible on the ground.

In attempting to prevent slipping, and to afford a firm hold of the ground, without having recourse to calkins, a great object is to diminish the wide surface of metal of the shoe, interfering as little as possible with its resistance to wear. The simplest method of doing this is merely to change the bevel on the foot surface of the ordinary shoe to its ground surface—making what is now concave, flat, and what is now the flat slippery ground-surface, concave. The effect is almost magical in the security it gives the animal during progression, and is best exemplified in the case of the hunter, which is usually shod with shoes of this description. Here again we are only imitating Nature by copying the concavity of the sole. There can be no doubt whatever as to the advantages to be gained by using such shoes. The sole is pretty well supported, as well as the whole of the wall, by the wider surface of metal above, while the narrow surface towards the ground affords security of tread.

For general purposes, this is an excellent form of shoe; but to make it still more efficient, I devised a modification of it some years ago, which is an almost exact reproduction in iron of the ground surface of this part of the hoof; it has been employed

on the road and in the field with most satisfactory results, both on the fore and hind feet.

In this shoe (fig. 16), instead of the bevel on the ground

Fig. 16.

Ground-surface of the Modified Shoe, showing the bevel and catches.

surface gradually becoming shallower as it approaches the heels, as in the ordinary hunting shoe, it becomes deeper until within an inch or two of the extremity of the branch, where it has cut down through the thickness of the inner border; it then abruptly ceases, leaving a sharp catch on each side that, like the inflexion of the wall at this part (fig. 6, *d d*), affords an excellent grip, which moreover lasts until the shoe is quite worn out. With a modification of this kind, three important objects are secured: 1. The plane upper surface, resting flat and solidly on the crust and unpared sole, leaves no space in which foreign bodies—as clay, stones, or gravel—may lodge, and in heavy ground suction is lessened. 2. The metal is only removed from the parts where it can be best spared, and where there is least wear; consequently the shoe is lightened without being weakened. 3. The level border and extremities of the branches afford an equal bearing for the foot, while the gradually deepening bevel, with

its sudden check, secures a permanent and powerful catching point, like that at the angle of the wall.

The shoe is easily made by any farrier, differing, as it does, so little from the ordinary hunting shoe, and the shape is the same for the fore as the hind shoe, except that the former is, of course, more circular than the latter, to correspond with the shape of the hoof.

To make its fabrication as simple, speedy, and easy as the ordinary shoe, I have it made in two moulds or "cresses," which fit into the anvil. These moulds are of iron faced with steel; one (fig. 17) has two wide, slightly curved transverse grooves cut on its surface, the one side of each being shallower than the other; in these each branch of the shoe is moulded. The other cress (fig. 18) has also two indentations so formed as to cut the check or "sunk calkin." With these moulds, the shoe is as easily and quickly made as the common one, and requires but little finishing. The moulds may be of three

Fig. 17.

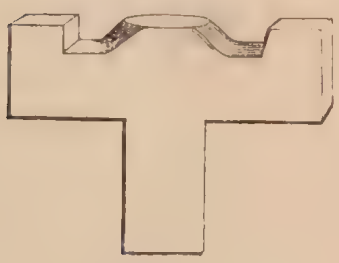
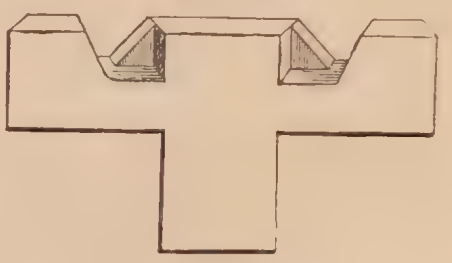


Fig. 18.



Moulds for the fabrication of the Modified Shoe.

sizes, to suit different sized feet and different kinds of work, and can be forged by any ordinary blacksmith or farrier.*

* I have given the models of these moulds, as well as patterns of the shoes, to Messrs. Arnold and Son, West Smithfield, London.

This shoe has been somewhat extensively tried on carriage and saddle horses, and with the very best results. For hunting or cavalry purposes it is excellent, particularly on slippery grass-land, the sharp point of the catch biting the surface of the ground most effectively.

Clips.—For carriage and saddle horses and hunters, each fore and hind shoe should have a clip drawn up at the middle of the toe, except in special cases, as when the horse overreaches, or from being required to jump or any other cause, is likely to strike any part of the back of the fore legs; in which case the hind shoes require to have a clip at each side of the toe—none in the middle—the hoof in front being allowed to project beyond the shoe; the latter should have all sharp edges carefully removed at this part, particularly in the case of hunters.

Clips, when judiciously placed, are of service in retaining the shoe, and so permitting the number of nails to be diminished; but, as a rule, they should be as few as possible, as they are sometimes a source of injury to the hoof, particularly if they are situated in too close proximity to the nails.

Varieties of Shoes.—Various forms of shoes have been from time to time proposed with a view to prevent slipping, but only those which have had their ground surface grooved, bevelled, or "toothed" have met with any success. In recent times, an American shoe, the "Goodenough," has had wonderful qualities claimed for it in this respect. It differs but little from the common hunting shoe; it has several trivial projections cut on the outer margin of its lower surface, which may prevent

slipping so long as they last, but in a very short time they are worn away, and then it has nothing to recommend it beyond the ordinary hunting shoe. The shoe is made by machinery.

Mr. Gray, of the Mowbray Works, Sheffield, has introduced machine-made shoes faced with steel, and grooved into two or more sharp ridges on their ground surface. When fitted these shoes are tempered; consequently they are harder than iron, should wear for a longer period, and may thus be made lighter. If their hardness does not cause them to be more slippery on smooth pavement when the ridges have become somewhat worn, than the iron shoe, they should be an improvement, and prove cheaper than those commonly in use.

More recently, grooved and surface-cut rolled iron bars have been introduced with some success for the manufacture of horse-shoes.

Material.—Machine-made horse-shoes have, unfortunately never proved successful, from the material of which they are manufactured proving either very soft—when they were too rapidly worn-out—or too hard, when they had a tendency either to break or induce slipping.

We have remarked how important it is that the shoes worn by horses should be as light as possible. It is generally a good plan, if a horse wears his shoes more at one part than another, so that they do not last a sufficient time, to weld in a small piece of steel at that place, instead of thickening the shoe, and making it heavier. The latter method, which is that generally adopted to save time, most frequently defeats its purpose—the

increased weight causing the animal to drag its feet heavily along the ground, instead of lifting them freely.

Lightness and durability can only be attained by employing the best material.

Nail-holes.—The form of the shoe having been decided upon, the position and shape of the nail-holes, as well as their number, have next to be considered.

The shoe ought to be attached by nails to those parts of the wall where the horn is strongest and toughest. In the fore foot, these parts are in front and along the sides, to the quarters; there the horn becomes narrow and thin, the nails find less support, and are nearer to the living textures; this is more particularly the case towards the heels, and especially the inner one. In the hind foot, the wall is generally stronger towards the quarters and heels. These facts at once give us an indication as to the best position for the nail-holes. In the fore foot, nails can be driven through the wall around the toe as far as the inside quarter, and a little nearer the heel on the outside. In the hind foot, they may be driven around the toe, and even up to the heels with impunity.

The form of the nail-holes is a matter of secondary importance. The "fullering," or groove, around the border of the English shoe, though artistic-looking, is a mistake; it is a waste of labour, and of but little, if any, service. What is termed the "stamped shoe," is in every way preferable. The square, or somewhat oval cavity, wide at the top and tapering towards the bottom, gives a secure and solid lodgment to the nail-head, which of course should accurately fit the cavity; it does not

weaken the iron, is easily made, can be placed nearer the outer or inner margin of the plate as required, and when filled with the nail-head is as capable of resisting wear as any other part of the shoe. It is usually better to have the nail-holes stamped "coarse" (that is, at some distance from the outer margin of the shoe), at points corresponding to those parts of the hoof where the wall is strongest; and "finer," where the horn is thin and its fibres short.

They should not, as a rule, incline outwards or inwards, but be so perforated that the nail-point can take a strong or weak (thick or thin) hold of the wall, according to circumstances. If the hoof be strong, with plenty of wall at its lower margin, then the holes may be stamped *coarse*, in order to take a short but solid hold of it, by driving the nails obliquely outwards (as in fig. 19, *a*).

Fig. 19.

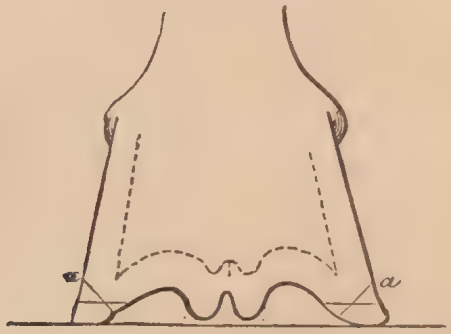


Diagram of the Hoof and Shoe, to show the direction the nails should take.

The number of nail-holes through which nails are to be driven should be as few as possible. Every nail penetrating the wall of the foot, no matter how skilfully it may be placed, may be looked upon as a source of injury to it, by splitting asunder or breaking its fibres. On the form and weight of the shoe, will

greatly depend the number of nails required to retain it. With that I have described as used in hunting, or as modified by me, and which rests firmly on wall and sole, in addition to its being as light as is compatible with a certain period of wear, but few nails are needed. The ordinary heavy shoe, on the contrary, is not only damaging to the foot, because it rests on such a narrow basis; but also because its weight and instability necessitate its being attached by a large number of long thick nails, which do great harm to the hoof.

With care in fitting a properly constructed shoe, and skill in placing the nails firmly in sound horn, the usual number may be considerably reduced; so that instead of seven to ten being required, it will be found that from four to six are equally serviceable, and even these may be of diminished size. For shoes worn by medium-sized draught horses, I seldom allow more than six nails in the fore and seven in the hind feet; more frequently the former are secured by five nails—three in the outside and two in the inside branch of the shoe, and the latter by three on each side.

The fewer the number of nail-holes, the greater is the necessity for distributing them wide apart; indeed, it is a grave blunder to cluster the nails closely together in the hoof, as they break and weaken the horn, and attach the shoe much less securely than if they were spread over a wider surface. Calkins demand the employment of additional nails, from their liability to become fixed between stones, and also from the strain they occasion.

It must always be remembered, that the retention of a shoe

for a sufficient period does not so much depend upon the number of nails attaching it, as upon their disposition, and upon its exact fitting and solid bearing on the wall and sole of the hoof. It should also be borne in mind, that where there is a clip there ought to be no nail; lameness is not unfrequently produced by a tightly adjusted clip making so much pressure upon the nail and horn within it, as to cause pain and inflammation.

We have alluded to the various patterns of shoes in use, and pointed out their defects and requirements. As, in preparing the hoof, general principles were laid down which are applicable to every kind of animal—from the race horse to the mammoth draught beast employed in our large manufacturing cities—so in the shape of the shoe and its essential characteristics general principles must everywhere prevail. Where speed is demanded, as in the race-horse, hunter, etc., lightness and security of foothold on soft or slippery land are the chief *desiderata;* with coach and other draught animals of less speed, and which are principally used on paved roads, heavier shoes are needed to sustain wear, and they must also afford security; but while, with the racer, hunter, and other animals nearly always moving over soft soil, calkins may be resorted to without much detriment to the limb and foot, as they sink into the ground, on the shoes of horses working on hard roads they are objectionable for the reasons stated; if they are resorted to their injurious action should be averted by employing a toe-piece of the same height.

For the race-horse the narrowest iron rim is sufficient,

provided it is strong enough not to twist or bend. The present form of shoe is not objectionable.

For hunters, hacks, and harness horses, a shoe of the modified pattern I have described is well adapted; even the ordinary hunting pattern, but without the calkin on the hind shoe, is infinitely preferable to that used for hacks and harness horses.

Another excellent form of shoe, introduced by Staff Veterinary Surgeon Thacker, and which has been in use for some time at Woolwich on riding and harness horses, deserves to be mentioned here. It is broader in the cover at the toe than the heels (fig. 20); at the toe it is slightly curved upwards, to remove it from the greater amount of wear occurring at this part, and also as a safeguard against stumbling. This curve likewise acts as a clip to prevent the shoe driving backwards. The foot surface is quite flat, and rests on the sole and wall (fig. 20). The ground surface (fig. 21) is

Fig. 20.

Fig. 21.

bevelled somewhat like the hunting or modified shoe I have described, with the intention of protecting the heads of the nails from too much wear, and offering no line or cavity whereby a stone can lodge or become wedged. The cover or

"web" of the shoe is gradually brought very narrow at the heels, its outer rim corresponding exactly with the crust, and the ends of the branches terminating at the heels of the foot; thus offering protection to the crust only, and without presenting any surface to be trodden upon, or allowing the least suction in heavy ground.

The nail-holes are in the centre of the *web*, and are directed outwards, by which the nails pass obliquely across the fibres of the wall and secure a good hold, without approaching the sensitive parts too closely. Three-fourths of an inch is supposed to be the height necessary to drive the nails.

There are two small clips—one on each side of the curvature at the toe, and these not only support the diminished number of nails, but require that the farrier fit the shoe to the circumference of the foot. The smallest-sized nails should be invariably used, and fitted into each nail-hole before applying the shoe. Shoe to be light and made of good material. This pattern, like the modified shoe I have proposed, is suitable for either fore or hind feet.

It may be mentioned that, with the exception of the two side clips at the toe, this shoe is nearly identical in shape with that recommended by Colonel Fitzwygram in his excellent work on Shoeing.

APPLYING THE SHOE.

The foot having been duly prepared, and the form of shoe decided upon, the next step is to apply the shoe to the hoof, and retain it there by nails.

In ordinary practice, the wall of the foot has been only partially diminished, the remainder of the task being left until the shoe has to be fitted. This causes the farrier to have a very imperfect idea of the proper shape or size of the hoof, and he therefore prepares a shoe which he guesses is *about* the size, though in nearly every case it is too small; and moulding it according to his fancy, *he proceeds to adjust the foot to it.* This is done by cutting more or less deeply into the wall at the toe, to make the shoe appear long enough by imbedding the clip deeply in its substance, or "letting it back," as it is termed. The consequence is that, when the shoe has been nailed on, the basis of support of the limb is very much diminished, a large portion of the wall of the hoof—its strongest portion—projects beyond the shoe in front and at the sides, and this is afterwards carefully removed by the rasp, to the great injury of the most essential portion of the hoof. In every respect, the foot is made to fit the shape of the shoe, and as this is generally prepared with a view only to neatness or the traditions of routine, the organ suffers to please the fancy or fashion of the unreasoning artizan.

By our method, the horn having been reduced to proper dimensions, the shoe is now made to fit the hoof exactly, and to follow the outline of its lower face. The part of the hoof intended to be protected by the iron rim has been made as level as possible by the rasp, aided a very little, perhaps, by the knife; the surface of the shoe destined to rest on this horny bed has also been made perfectly level and smooth, particularly at the clip or clips, and it is to be correctly fitted. The farrier

should so mould the shoe that it will be an exact reproduction in outline of the circumference of the hoof. To cause it to appear so when applied, it may be necessary to remove a little of the wall at the part corresponding to the clip, merely to make the fit more accurate, and not allow any portion of the shoe to project unduly beyond the horn.

The length of the shoe will vary with the services demanded from the horse. For racing, hunting, and other purposes in which the hind limbs are carried forward to an extreme degree in propelling the body, the branches of the fore shoe must on no account extend beyond the inflexion of the wall, otherwise the shoe is liable to be torn off by the hind foot, and the horse thrown down. The end of the branch should also be carefully rounded off and bevelled (as in fig. 16), so as to leave nothing whatever by which the hind shoe might catch it.

With harness and draught horses, this extreme care in shortening and bevelling the heels is not so necessary; indeed, in the heavier and slower-paced animals, it is frequently advantageous to allow the shoes to be rather longer in the branches than the hoof itself.

As a rule, then, the shoe ought to be wide enough at the toe, quarters, and heels to support the entire thickness of the wall, but yet not so wide or long as to endanger the opposite limbs by striking them, or run the chance of being torn off by the other feet treading upon it; and it should not interfere with the frog, nor prevent that organ from playing its part in the physiology of the foot.

The adjustment of the shoe to the exact circumference of the

hoof, is usually effected at the same time as the fitting together of the two surfaces of iron and horn which are to remain in contact. To render both accurate, the horse should always be shod at a forge. A hammer and anvil are necessary to mould the heated shoe to the requisite shape; and it is almost, if not quite, impossible to obtain a perfectly true and solid adaptation of the upper face of the shoe to the horn on which it is to rest, within any reasonable time, unless it be fitted to the hoof in a hot state.

Hot and Cold Fitting.—For very many years the two systems of fitting horse-shoes in a cold and a heated condition to the hoofs have been extensively and severely tested, and the result has been that cold fitting is, as a rule, only resorted to when circumstances prevent the adoption of the other method; or when the owner of a horse, imagining that the hot shoe injures the foot, incurs the risks attending a bad fit to guard against this imaginary evil.

It is needless, in a brief essay like the present, to enter into a relation of the observations and experiments which have established the undoubted and great superiority of what is termed "hot" to "cold" fitting. These will be found noticed at some length in a work recently published by me.* It may be sufficient to state, that the evils supposed to result from fitting the shoes hot to the hoofs are purely chimerical. It is true, when the sole is excessively mutilated, should the farrier keep the heated shoe too long in contact with it, injury would

* "Horse-Shoes and Horse-Shoeing: their Origin, History, Uses, and Abuses." London: Chapman and Hall.

doubtless follow; but this accident is so exceedingly rare as to be scarcely ever known, even in forges where shoeing is performed in the most objectionable manner. The ill effects imagined to arise from hot shoeing can easily be traced to the operation of other causes, not the least of which is the fashion of paring the lower face of the foot.

The chief objections to cold shoeing are the absence of solidity, the foot being made to fit the shoe; and the process being more difficult and expensive.

The defective solidity is patent to every one who has had any experience in the matter. It is impossible to level the ends of the horn-fibres so accurately that they will all rest evenly on the surface of the iron; so those which are most prominent soon giving way to pressure, the bed of the shoe is altered, and this becoming loose, is either lost, or we have projecting clenches. And even should the fibres be made perfectly level, wet softens them, causing them to become pulpy and shorter, by which means the seat of the shoe is altered and the nails lose their firm hold of the wall. Ample experience on active service, as well as that gathered at home during peace, has demonstrated the instability resulting from cold fitting.

Owing to the increased trouble and loss of time incurred by this method, in attempts to make the shoe fit somewhat accurately, but few farriers can afford or are willing to resort to it. Hence, when it is practised, if the shoe is at all like the foot, it is put on, and rasp and knife ensure the hoof being made to fit the iron. This proceeding is very injurious.

In hot fitting we have none of these objections. The shoe is

very readily adapted to the foot; it is more equally applied, and rests solidly on the hoof, so that the nails are not broken or displaced by the shoe becoming loose; in fine, there is a more intimate contact between the iron and the surface of the horn. The very fact of burning or fusing the ends of the fibres ensures a solid durable bed, which cannot be obtained otherwise; as this destroys the spongy absorbent properties of the horn, and renders it eminently calculated to withstand the influence of moisture. The effects produced on horn by the hot iron have been compared to those of fire on pieces of wood, the ends of which have been superficially carbonized before being buried in the ground. Every one knows that this operation contributes to the preservation of the wood, by preserving it from the action of humidity.

Horn is a slow conductor of heat, and it requires a very prolonged application of the hot shoe to affect the hoof to any considerable depth. Three minutes' burning of the lower face of the sole has been found necessary to produce any indication of increase of temperature by the thermometer on its upper surface. It is never requisite that the shoe should be applied longer than a few seconds.

The hot shoe, in fusing the horn with which it comes in contact, imprints itself like a seal in melted sealing-wax, and in this way the two surfaces of foot and shoe exactly coincide; while no matter how expert the workman may be in using his tools to level the horn in a cold state, he can never do this so quickly, nor so completely, as may be done by making an impression with the heated iron, and consequently establishing

between the lower margin of the hoof and the shoe an exact coaptation.

It may be added, that when the surface of the horn has been softened by the action of caloric, the nails enter it more readily, the clips and inequalities are more easily embedded, and when it recovers its habitual consistency after cooling, the union between it and the metallic parts which are in contact becomes all the more intimate because of the slight shrinking that follows the expansion produced by the heat. Under these conditions, the horn contracts on the shanks of the nails, and retains them more securely.

All the most competent veterinary authorities who have studied the subject, are unanimous in recommending hot fitting in preference to cold; the latter is only justifiable when it is impossible to adopt the former. The red-hot shoe at once disposes of those inequalities which cannot be discovered or removed by tools; and it shows the workman at a glance the bearing of the shoe on the hoof, as well as the imprint of the nail holes. Without being re-heated, any alteration can be readily and at once effected, in moulding the shoe to the shape of the hoof.

The whole surface of the iron intended to be in contact with the horn should be distinctly impressed on the contour of the hoof, so as to ensure the closest and most accurate intimacy between the two; and this carbonized surface should not be interfered with on any account, except by the rasp, which is only to be employed in removing any sharpness or inequality on the extreme edge of the wall, that may have been produced in fitting.

It is necessary to bear in mind that the shoe should be fitted at a *red-heat.* Its application then need only be very brief, and it is far more effective in producing a solid level surface; it ought not to be applied at a *black-heat.* Should the margin of the hoof not be sufficiently levelled by the rasp before the application of the hot shoe, a slight contact of the latter will show the inequalities, and these may then be removed by rasp or knife. On no occasion ought the shoe to remain longer on the hoof than is necessary to produce a solid and perfectly level surface.

The Nails.—The shoe having been made to fit the hoof exactly, is cooled and finished with the file. It is then ready to be attached to the hoof by nails. These should not be unnecessarily large, as is too often the case, but well proportioned to the size of the shoe. The heads should only be sufficient to fill the nail-holes, when they are subjected to two or three smart blows of the hammer, and the shanks ought to be thin. It is scarcely necessary to add that the nails, like the shoe, should always be made of the best iron.

Driving the Nails.—In driving the nails into the hoof, every one should be made to pass through sound horn. It is a mistake to place them where the wall is broken or perforated by previous nails, as this only makes bad worse; and care should be taken to direct each nail so accurately, that it may make its exit at the desired point in the face of the wall at once. Careless or unskilful driving of the nails necessitates their being withdrawn several times before they are properly implanted; and as each nail, however carefully it may be placed in the

wall at the first attempt, is a source of injury by splitting asunder and perforating the fibres, it follows that when several attempts have to be made the injury is proportionately increased.

A short thick hold of the wall is better than a long thin one; and, if possible, no more horn should be included within the grasp of the nail than is likely to be removed at the following shoeing. By this means the wall is constantly maintained sound.

A foot allowed to grow strong in the manner I have described, will suffer no inconvenience in having the nails driven tightly into the shoe and hoof after they have been placed in their proper situation.

Where the hoof is thin, as at the quarters and heels of the fore foot, smaller and more slender nails must be used, and these must be less tightly driven. The nails at the front part or toe should be first hammered home firmly, then the quarter and heel nails gradually lighter. Every nail should form a part of the shoe, and the head should barely project above it; when all are solidly disposed, they must be tightly "drawn up" at the ends (the points having been twisted off previously) by means of the hammer and pincers, using the same graduated degree of force as in driving them home.

Conclusion of the Operation.—Nothing now remains to be done but to bend down, or "clench," the portion of nail so drawn-up on the face of the wall. This should be accomplished by shortening the fragment to a proper length by the rasp, so as to leave just enough to turn over; the rasp also removes the small barb of horn raised in drawing up the nail, but without making a notch, and then the clench is laid down evenly. No

more rasping or cutting should be allowed on any pretext whatever.

Rasping.—Very different to this treatment is that practised in nearly every forge, where the front of the hoof is rasped most unmercifully as high as the coronet. Indeed, in the majority of books on farriery it is recommended that, though the wall ought not to be rasped above the clenches, this must be done below them: evidently ignorant of the fact that nearly as much, if not more, harm is done by this operation below than above these rivets.

Those who study what I have said relative to the structure of the wall of the hoof, will readily enough understand the amount of injury inflicted on the foot by this rasping.

Over the whole external face of this part there appears to be spread a fine translucent horn, which looks like a varnish, whose office, in all probability, is to prevent undue drying of the hoof, and consequent brittleness. Immediately beneath this are the dense resisting fibres of the wall, which are intended to sustain wear, and are best adapted to support a shoe, through the medium of the nails; in fact, they are the fibres which ought to perform this duty, as beneath them, towards the inside of the wall, the horn rapidly becomes soft and spongy, and more like the pith of a rush.

In consequence of the farrier having neglected to remove a sufficient amount of horn from the lower margin of the wall, when preparing the foot for the shoe, or through having nailed on a plate too small for the natural circumference of the hoof, a large piece of this solid material projects beyond the shoe,

particularly in front and at the sides. This is torn away by the rasp, after the clenches have been laid down; and when this has been done what do we see? The wall of the foot, instead of coming down from the coronet to the shoe in all its integrity and evenness of slope, as soon as it reaches the clenches is chopped abruptly downwards, giving the foot a stump or club-like appearance, and greatly diminishing the extent of its bearing surface. The greatest evil, however, is the loss of the strong tough horn, whose presence is so necessary to protect the lower margin of the hoof, and afford support and hold to the nails.

In consequence of its removal, these have nothing to retain them but the thin pellicle of soft horn remaining, and this being so weak, and suddenly exposed to influences it was never intended to encounter, quickly dries up, shrivels, becomes brittle, and cracks or breaks away in flakes. Then we have a hoof deprived of its horn, and in as unnatural a condition as can well be imagined; it has been so barbarously mutilated as to require the greatest care, at the next shoeing, to place the nails in a shred of sound horn; the operation of rasping and curtailment being repeated each time increases the evil, and should a shoe chance to come off on the road—an accident, it may be inferred, extremely likely to happen—great damage will be done to the pared sole, and the thin, brittle, split-up wall, and in all probability, after a few yards travelling, the animal will be lame.

The morbid desire to make fine work of shoeing, when the horse was first shod, ends in the greatest amount of skill and labour being required to continue it, and to keep the animal to

some extent fit for service; though with deformed feet, seriously damaged horn, and perhaps great suffering.

The truth of this can be verified by a casual glance at the hoofs of almost every horse that passes us in town or country—though perhaps it is most conspicuous in town-shod horses.

One of the most serious results of this excessive mutilation of the lower part of the wall is the production of a chronic form of laminitis, marked by slight subsidence half way down the front of the foot and, to a less degree, at the sides, with an abrupt rounded protrusion of the part that is always exposed to rasping.

This deformity, which induces pain and altered gait in the great majority of cases, arises from the irritation caused to the sensitive parts within, by the removal of their natural protection; but more particularly from the fact, that the nails, to retain the shoe, must be driven through a sufficient amount of the soft horn, and this brings them so near the living parts that they press upon them, and to such a degree as to set up an acute or subacute inflammation that leads to this deformity and its attendant lameness.

Cases of this description will be found to be by no means uncommon among the horses in our streets, and for many years I have been able to trace the evil effects of the practice from their commencement until the animal was a hopeless cripple.

When the coachman, groom, or farrier's fancy causes the rasp to be carried above the clenches to the top of the hoof, then of course the injury is greatly aggravated.

The thin semi-translucent horn that extends in a somewhat

wide, whitish-coloured band around the upper part of the foot, is chiefly intended by Nature, I think, to protect the fibres of the wall from the effects of external physical influences, such as heat and dryness, while they are being secreted, or so immature as to be incapable of resisting these influences: for it will be remembered that the wall is formed at the coronet, and this covering guarantees not only the integrity of the newly-made horn-tubes, but also maintains the secreting vessels that enter them in a healthy condition, and competent to supply fresh material for wear.

The destruction of this band, and the rasping of the fibres beneath it, is detrimental to the healthy secretion of the wall-fibres, and leads to the same result that paring the sole was shown to do: shrinking of the horn-tubes containing the tufts of vessels, wasting of these, a diminished supply of horny material in consequence, and a thin brittle wall that scarcely appears to grow in depth or thickness, and barely allows a shoe to be attached to it. Sandcrack and other diseased conditions of this part of the hoof are also mainly due to this cause.

After applying the shoe in the manner we have described, and laying down the clenches evenly on the wall of the hoof, no more requires to be done, unless perhaps it be to round a little more the edge of the narrow shreds of horn that may project on each side of the clip, and thus prevent their liability to split. The angle of the face of the hoof should never be interfered with after the shoe is nailed on, but should be the same from top to bottom as in the natural state. This is a matter

of great importance. Too much stress cannot be laid upon the preservation of the horn of the hoof in its integrity. No amount of rasping or artificial treatment can give the hoof the beautiful polish it has in its natural state.

Laying down Clips.—At this stage, it is usual to apply the clip or clips more exactly and evenly to the hoof before completing the operation of shoeing; and even this apparently trifling matter demands care. With gradually decreasing blows of the shoeing hammer, each clip should be applied close to the hoof, commencing at the bottom, where it springs from the shoe, and ascending to its point. Clips should never be driven tight into the hoof; this is injurious and may induce disease.

When, in due course, the period arrives for re-shoeing—usually in a month or five weeks—the hoofs require to be reduced to their normal dimensions; then the rules we have laid down for guidance are to be followed out in the most scrupulous manner. The old shoe is to be *gently* removed from the foot, by carefully cutting away the clenches with the buffer; the pincers are to be inserted towards the heel, between the hoof and shoe, and the latter prized steadily *upwards from* and *across* the foot. When, by this means, the nails have been sufficiently sprung, they may be withdrawn one by one. Particular care must be taken that no clenches or broken nails remain in the hoof, as these are likely to turn the points of the succeeding nails into the living parts of the foot.

Such, then, on the one hand, is shoeing as it is usually practised, to the great injury of the horse; and, on the other hand,

shoeing as it ought to be performed, so as to maintain the comfort and efficiency of this noble and invaluable animal.

It will be observed that no claim is here made to any wonderful novelty or discovery in the way of a shoe that will answer every purpose, and keep every horse wearing it in a state of health. Such an invention must be left to those whose practical experience is of the most limited character, and who fancy that the evils of shoeing are concentrated in the metal plate alone. It may be sufficient to say, in this place, that so far as the comfort, utility, and well-being of the horse are concerned, the preservation of the foot in health by abstaining from mutilating and deforming it with knife and rasp, is of the highest importance. If this be done, the shoe most appropriate for certain purposes demands some attention, but is really a matter of minor consideration.

Preserve the hoof intact and strong, and the animal will travel long and soundly in a very uncouth foot armature; pare and rasp it according to "improved principles," and the most laboured, expensive, and artistic device in the form of a shoe will not prevent discomfort, unsoundness, disease, and premature uselessness.

At an early period of my professional career, I was much dissatisfied with the results of shoeing as it is practised in ordinary forges, as well as with the unreasonableness of the fashion of depriving the foot of its natural and most efficient protection, and in a short time was led to perceive that a vast majority of the horses so treated soon became deformed and lame in their feet; while some of the diseases

occurring higher up in the limbs could also be attributed to this cause.

The rational method here inculcated was then adopted, and now for very many years the only preparation the foot has received for the shoe has been levelling the wall, in conformity with the direction of the limb and foot, and removing as much of its margin as will restore it to its natural length, leaving the sole, frog, bars, and heels in all their integrity. Such has been the treatment of the hoofs of the horses under my care in various parts of the world, and in far more trying circumstances at times, so far as shoeing is concerned, than are likely to occur in the regular work of towns; and so strong were the hoofs, as a rule,—such solid blocks of horn did they appear, that when a shoe was, by some rare chance, lost on a journey, there was no danger whatever to be apprehended from marching the horse ten, twenty, or even thirty miles, without it. Horses have never been pricked in nailing, and foot diseases, it may be said, have been all but unknown. The roughest roads and the sharpest stones have been travelled over with impunity, and nearly every hoof might be taken as a model, and be pronounced as perfect as before the animal was shod many years previously.

This abstinence from paring and rasping, it will be seen, very materially lessens the time and labour required in the ordinary method; indeed, nothing can be simpler than the conservative principle of shoeing, and this simplicity can be effectively carried into practice with one-half the instruction and toil required for the popular mode.

VARIOUS OTHER METHODS OF SHOEING.—Other methods of

shoeing have been devised from time to time, and may be referred to here.

To diminish the weight, and permit a portion of the posterior part of the foot to come in direct contact with the ground, along with the frog, a three-quarter shoe is often applied—the portion of iron extending from the inside quarter to the point of the heel being cut off, and the shoe at this part thinned a little. The horn left unprotected is never interfered with. This is an excellent shoe for saddle and carriage, and even draught horses, which may be employed on the worst roads while wearing it. For feet that have suffered very much from the effects of rasping and paring, and which are liable to have bruised heels (or corns), its use is attended with the greatest benefit; though it possesses some faults which militate against its adoption generally.

The same may be said of "tips," or half-shoes. An unreasonable prejudice appears to exist against the use of these light, short plates; but if they are applied in appropriate cases, there can be no doubt whatever that they are entitled to a far larger share of attention than they have yet received. Their very limited employment hitherto, may have arisen from the imperfect manner in which they have been used. They protect those parts of the wall most exposed to damage by wear—extending around the toe, and reaching no farther than the quarters; while the heels and frog, when left unpared and unrasped, are strong enough to meet all demands made upon them, at the same time they are not deprived of their physiological functions.

In addition to these considerations, the diminution in the weight of the shoe is a matter of some importance. It has been objected to "tips" that they cause too much strain to be thrown on the back part of the limbs, from the front of the hoof being lengthened out of proportion to the heels. This is certainly the case; but with the majority of hoofs a little management in partially imbedding the crescent-shaped plate at the toe, and leaving the heels, frog, and quarters intact, will obviate to a large extent, if not entirely, any harmful consequences. They have been used by me, with the greatest advantage, on carriage and saddle horses, and no objection could be urged against their employment beyond those fancied faults conjured up by grooms and farriers, who could not understand the object to be attained in resorting to them.

Of course, the three-quarter shoe and the tip are only required for the fore-feet; the hind-feet shoes, so long as they are level, are not over heavy, and do not wound the opposite limbs, may be of the ordinary pattern.

On this difference between the management of the fore and hind foot we cannot too much insist. The fore foot is particularly disposed to disease and injury; the hind foot is wonderfully exempt. So much is this the case, indeed, that the proper management of the first is all-important, while the other requires but little attention. The reason of this is due to the fact, that the horizontal body and long heavy neck and head of the horse cause the largest proportion of the weight to fall upon the front pair of supporting columns, and, through them, upon the feet: the fore limbs are those most concerned

in supporting weight, the hind ones in propelling the body forwards. Hence the necessity for allowing as much of the lower face of the fore foot as possible to come in contact with the ground; and hence the prevalence of disease in it when improper shoeing limits its points of contact to the narrowest dimensions.

Another form of shoe is that commonly known as the "bar shoe"—a ring or annular plate of metal, which increases the surface of contact by resting, to a large extent, on the frog, and allowing that important body to participate in weight-bearing; in this way it also relieves the heels when these are weak or injured. It is a very useful shoe, but the additional weight given to it by the bar, and the extra strain on the nails retaining it to the hoof, are drawbacks.

Preplantar Shoeing.—To apply a shoe in such a manner as to allow the frog to receive a due amount of pressure, has always been the aim of those who have made the horse's foot an object of careful study. Even with the ordinary shoe, if it be not too thick or garnished with calkins, the frog, if unmutilated, in the large majority of cases will rest upon the ground for nearly the whole of its length, and will sustain beneficial wear. Nearly every one of the horses at present in my charge, though shod with the army regulation shoe—a very defective model—have their frogs in this condition; while all the private horses wearing the modified shoe I have described, exhibit the frog resting for the whole of its length and breadth on the ground.

But this object, with others of importance, is perfectly

attained in what has been designated the "periplantar or preplantar shoe and method of shoeing," introduced by Veterinary Surgeon Charlier, of Paris.* Leave the hoof entirely in its natural condition, so far as frog, sole, and wall are concerned, and imbed a narrow rim of iron, no thicker than the wall, around the lower circumference of the foot—that exposed to wear—in a similar manner to the iron heel of a man's boot, and we obtain an idea of what the periplantar or preplantar method of shoeing really is.

The principle on which this method of shoeing is based, is, physiologically, perfectly correct. Knowing that the horse's foot is admirably constructed to perform certain definite functions, and that the hoof, in ordinary conditions, is designed to act as the medium through which the most important of these are carried out, but that its circumference is liable to be broken away and worn when unduly exposed; we have only to substitute, for a certain portion of this perishable horn, an equivalent portion of a more durable material, and the hoof is secured from damage by wear, while its natural functions remain unimpaired.

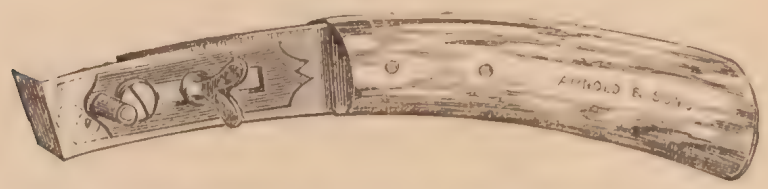
This novel method of shoeing has attracted so much attention, and has in many instances, I might say in almost every instance, proved so beneficial and worthy of adoption, so far as my experience goes (I believe I was the first in this country to give it a trial), that I venture to describe, as briefly as possible, the way in which it is carried into execution in the forge.

The sole and frog, as well as the bars, are left unpared. The crust or wall is bevelled off at the edge by the rasp, and

* Introduced in 1865.

by means of a special knife with a movable guide, a groove or recess is made along this bevelled edge to receive the shoe. M. Charlier's knife has a fixed guide; so that no variation in the width of the recess for the iron rim is permitted. This is a great defect, as the shoe for a small-footed horse or pony should not be so wide as that for a large draught or carriage horse. The great inconvenience resulting from this defect, and the impossibility of making the shoe fit accurately around the margin

Fig. 22.



A Knife devised for Preplantar Shoeing, furnished with a Movable Guide. The dotted lines show the extent to which the Guide can be moved forward.

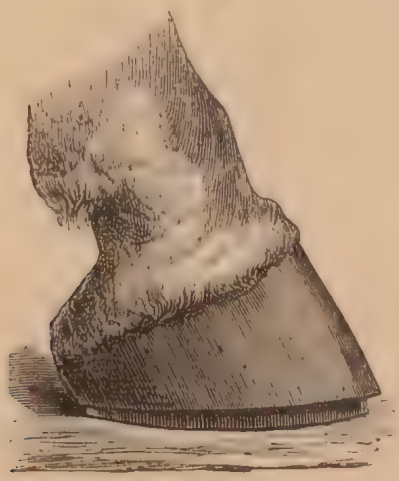
of the sole (without which its stability is endangered), caused me at once to devise a knife with a guide, which cuts a space of any width that may be necessary for the largest or the smallest rim.* This recess is made a little shallower than the thickness of the sole, and slightly narrower than the thickness of the wall, not extending beyond the white line separating the former from the latter (fig. 23).

Into this groove is fitted the shoe. This is a narrow, but somewhat deep band of iron (or, as now, a mixture of iron and steel), narrower at the top than the bottom, and forged in such a manner that its front surface follows the slope of the foot-

* This knife is manufactured and sold by Messrs. Arnold and Son, Instrument Makers, West Smithfield, London.

It is perforated by from four to six oval nail-holes of small size, and if required may be provided with a clip at the toe, though this I have never found necessary. Its upper inner edge is rounded by the file, to prevent it pressing too much against

Fig. 23.



Hoof prepared for the Preplantar Shoe.

the angle of the sole, and the ends of the branches are narrow and bevelled off towards the ground (fig. 24).

The nails are very small, and have a conical head and neck (fig. 25). They must be of the finest quality.

It is best to fit the shoe in a hot state, as it must have a level bed and follow exactly the outline of the wall. After it has been fitted, it is advisable to remove, by a small drawing knife, a little of the horn from the angle of the groove in the hoof, to correspond with the rounded inner edge of the shoe. This ensures a proper amount of space between the latter and the soft horn at the margin of the pedal bone.

In strong hoofs, the shoe is almost entirely buried in the groove; but in those which have the soles flat or convex, with

low heels, or which have been partially ruined by the ordinary method of shoeing, it is not safe to imbed it so deeply, at least to commence with.

Fig. 24.

THE FULL-LENGTH PREPLANTAR SHOE.

Fig. 25.

THE PREPLANTAR NAIL.

The application of the hot shoe in fitting should not extend beyond a very few seconds, and it should be pressed against the crust, or downwards, but never towards the border of the sole.

Fig. 26.

THE FULL-LENGTH PREPLANTAR SHOE attached to the hoof.

The shoe is nailed to the hoof in the ordinary manner (fig. 26). For saddle and light carriage horses, I have

usually found four nails—two on each side—sufficient to retain each shoe. These should be placed wide apart at the toe and rather close to the heel (fig. 27, *a*, *b*). Every nail must be driven in sound horn, otherwise the shoe, being so narrow, may get the branch twisted outwards; and nothing more is needed than to lay the clenches down evenly on the wall. No rasping of the front of the hoof is required, nor should it be allowed on

Fig. 27.

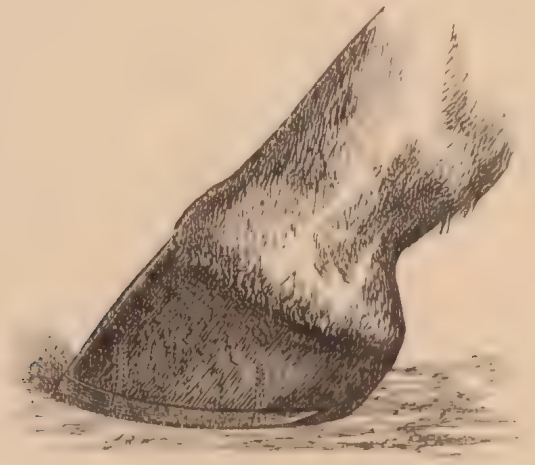
The ground surface of a Hoof shod with the Full-length Preplantar Shoe.

any pretence. When the shoe is attached to the foot, we then perceive, if it be sound and strong, that a portion of the sole and bars, and the whole of the frog, meet the ground as in the unshod state (fig. 27).

By many, the short shoe, about the length of an ordinary tip, is preferred to that which extends nearly to the heels; and in the majority of cases it will be found more serviceable, especially with horses used on soft land and at a quick pace —as hunters or racers. For more than two years I have employed this shortened shoe on horses travelling on the roads

—hacks and carriage horses—especially when the heels were high and strong. In these instances, the groove or recess was not cut to the point of the heels, but only the length of the shoe; so that the wall beyond this stood on a level with the plate (fig. 28).

Fig. 28.



Lateral View of a Hoof shod with the Short Preplantar Shoe.

Horses shod in this manner have travelled splendidly over all kinds of uneven, stony ground, as if the whole sole of the foot had been covered with a plate of iron; and the benefit to feet and limbs has been wonderful. For galloping on turf or slippery land, as well as for hard-wearing roadsters and carriage horses, the grooved steel-faced bars made by Mr. Gray, of Sheffield, are to be recommended for making the shoes from. They are lighter, and more durable and elegant-looking, than those made in the ordinary way (fig. 29).

The great advantages of this method of shoeing consist in its simplicity, when farriers have been made to understand it; its placing the hoof in a natural condition, so far as its ground face

is concerned; the small number and size of the nails required to retain it; the lightness of the shoe; and the security it gives the horse in progression.

Since its introduction by M. Charlier, I have tried this method on a large number of horses of various sizes, and which have been employed for hunting, road, carriage, and draught,

Fig. 29.

Short, grooved, steel-faced Preplantar Shoe.

and am perfectly satisfied that it is a valuable accessory mode of defending and preserving the hoofs, and remedying some of their diseases or defects. It cannot be applied indiscriminately to every foot, and to make the groove in the hoof, and to fit the shoe accurately, require some care. When the horn and metal are combined in this way, it is somewhat astonishing for how long a period a very light rim will sustain wear, even on hard roads.

It has encountered much opposition from the coachman, groom, and farrier class; merely, it would appear, because it is

simple and novel, does not quite harmonise with what they have been accustomed to, and does not suit their ideas on the subject. Many who do not belong to this class have condemned without trying it, for the simple reason, one might infer, that they imagined horses could not be made serviceable with it; while others, through having given it an improper or inadequate trial, have been unable to discover its particular merits. Even with those willing to give it every chance of success, and if successful adopt it, the fact that this method of shoeing is protected by a patent has proved a serious obstacle; not so much on account of the additional expense attending it, as from the trouble and annoyance of registering every shoeing and rendering an account. It is a pity that any invention which is to benefit the horse should be limited in its application by patents. The greatest benefactors to the noble animal have not been those who put a money premium on the benefits they conferred.

With an ordinary amount of care, any intelligent workman can shoe horses in this fashion. The chief points to be attended to, are making the recess no wider than the metal rim, which is largely supported by the margin of the sole; punching the nail-holes with a fine-pointed *round* punch, so as to cut through as few of the fibres of the metal as possible; hammering the nail-heads to the same shape as the nail-holes; and allowing the shoe to cool gradually, instead of immersing it in water after it has been fitted hot.

The imbedding of the shoes should only be carried out by degrees in cases in which the soles are thin, and it may require some time before they can be allowed to lie on a level

with the sole. Though, as a rule, the shoes last for a much longer time, comparatively, than ordinary shoes, yet it is advisable not to allow them to be worn too thin at the toe, as they are then liable to break.

Fig. 30.

Rasp for assisting in Forming the Recess in the Hoof.

When the foot is to be re-shod, nothing more is necessary than deeping the recess to the extent the hoof has grown since last shoeing, and applying the new shoe, which, of course, should exactly correspond to the outline of this part of the horny case.

Though the shoe is more expeditiously and accurately fitted in a hot than a cold state; yet when necessity requires it, a tolerably satisfactory shoeing may be accomplished without applying the hot rim. This is facilitated by the fine rasp (fig. 30), the device of Messrs. Arnold, which completes the work of the knife by making the recess level and regular.

I have not tried the shoe on the hind feet, because I do not think it is so well adapted for them; as before mentioned, the front feet only demand all our attention. Nevertheless, there is no reason why, with certain slight modifications, it should not answer perfectly well on the hind feet.*

* Mr. Stevens, Park Lane, Piccadilly, London, shoes with, and supplies models of, the preplantar shoe. Messrs. Arnold also, I believe, furnish pattern shoes.

WINTER SHOEING.

In such a variable climate as ours, it is not an easy matter to provide economically and successfully for the occurrence of frost and snow during the winter months, so far as shoeing is concerned. Some winters are so mild, that there is no necessity for making any difference in the shoe; while others are so severe, and the roads are covered with ice for such a long period, that special appliances must be resorted to if the services of horses are to be made at all available.

To be generally useful, these appliances must be cheap, efficient, and simple.

The quickest, cheapest, but at the same time least durable of these, is the "frost-nail." This is nothing more than the ordinary horse-shoe nail, with the head perhaps larger than usual, and flattened gradually to a thin edge. Two or three of the nails are withdrawn from each side of the shoe, and replaced by the frost-nails. The heads may be flattened in different directions according to circumstances. Sometimes the heads are of steel, when of course they are more lasting. For short journeys, frost-nails are useful and easily available; but as they only last for a brief period, and as their frequent renewal injures the hoof to some extent, they are only to be used when the services of the horse are not likely to be in great demand for any length of time, or when the frost promises to be very transient. They are best adapted for saddle and carriage horses. To prevent injury to the hoof, and at the same time to obtain all the advantages of frost-nails, I have often, in

the winter season, had extra holes punched in the shoes—one at the extremity of each heel, and one on each side of the toe. These nail-holes were large, and were stamped so obliquely outwards, that the frost-nails, when required, could be passed through them, and lapped firmly over the edge of the shoe, without interfering with the hoof. They may be made altogether of soft steel, the heads alone being tempered. I have found this plan most convenient and effective, as the hoof and shoe are not disturbed, and the nails can be renewed as often as may be necessary.

The usual plan is to remove the shoes from the hoofs, and give them sharpened calkins, and it may be toe-pieces, also sharp. This is not a good expedient if it has to be often repeated, as the hoofs are damaged by the frequent nailing, the horses are apt to be lamed, and the shoes to become loose. It is for the time being, however, very effective. When the calks and toe-pieces are only made of iron, and if the ground be not covered with a sufficient layer of snow to protect them to some extent, they soon become blunted, and the shoes then require to be taken off and the process repeated. To remedy this, if time permits, it is an excellent plan to weld in the calkin, or toe-piece, or on the face of the shoe, a piece of steel (figs. 31, 32 *a*), which, when sharpened and tempered, lasts a very considerable time.

Fig. 31.

Fig. 32.

In sharpening the calkins, regard must be had to their situation—that on the outside heel may be flattened across the branch of the shoe (fig. 33), but that on the inside must be drawn as much as possible from the outer margin of the branch

Fig. 33.

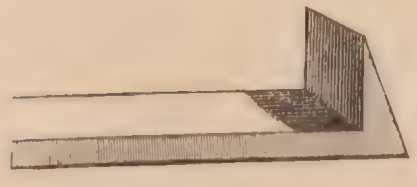
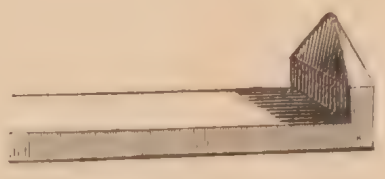


Fig. 34.



(fig. 34), in order to avoid treads and wounds to the opposite foot.

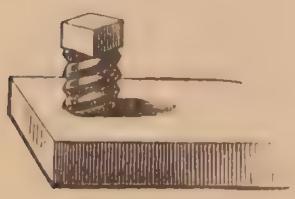
As a rule, it is better that toe-pieces of the same height as the calkins be used on all shoes, to keep the foot and limb from being injured.

The Canadian shoe, made of steel, concave on the ground surface, with the concavity forming a sharp edge on the margin, is very useful when there is a thick layer of ice with snow.

But perhaps the most useful, least hurtful, and expeditious method of making the horse efficient on ice-covered roads, is by the adoption of screw-studs. For these, each new shoe at the commencement of the winter has a circular hole punched at the heels, and another at the toe, if considered necessary. This is screwed, and into it is fitted, for ordinary wear, a flat-headed stud (fig. 35), which is turned in with a key or wrench. These studs last for some time, and preserve the shoe from wear; when worn nearly to the level of the shoe, they are removed and replaced by new ones. Should frost set in sud-

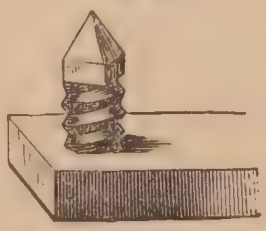
denly, the flat-headed studs have only to be removed by the groom when the horse is required, and sharp steel ones substituted. This can be done in a few minutes.

Fig. 35.



FLAT SCREW-STUD.

Fig. 36.



SHARP SCREW-STUD.

The usual shape of the sharp stud is that of a wedge, the screwed portion being much smaller than that projecting beyond the shoe. This is a faulty conformation, which leads to the stud frequently working itself loose and falling out, or breaking off at the neck, leaving the screwed portion in the shoe.

For some years I have remedied this defect by employing steel frost-studs of a conical or pyramidal shape, and having the portion screwed into the shoe as thick as that projecting from it (fig. 36). This pattern is not at all liable to turn round and fall out on meeting the ground; while, being the same thickness throughout, there is no check at the screw to weaken the stud; consequently it does not break if carefully forged and tempered.

Of all the appliances designed to enable horses to travel safely on ice, without taking them to the forge, or requiring the services of the farrier, none have stood the test of trial so satisfactorily as this screw stud. I have experimented with nearly every invention, but have found them either too compli-

cated or expensive, not fit for severe work, or only adapted for shoes of one pattern.

Quite recently, acting on a hint given me by Colonel Count Pratasoff Bachmeteff, Commandant of the Emperor of Russia's Body Guard, I have tried another form of frost-stud, which is simpler, easier made, and, therefore, much less expensive, and promises to be even more efficient than that just described. This merely consists of a square piece of steel, about the same length as the screw-stud, which is pointed and tempered at one

Fig. 37.

A Shoe, with the Unscrewed Steel Studs; one, shown within the shoe, has been removed from the aperture.

end (that which comes into contact with the ground or ice) and flat at the other end. This fits into a similar-shaped hole at the extremity of each branch of the shoe, and, if thought necessary, in the middle or at each side of the toe.

This hole should be very slightly tapering from the lower to the upper (or foot) surface, and it should be of such a size that

the square stud will require a slight tap or two to make it fit in tightly, yet without projecting at all beyond the level of the foot-surface of the shoe. I was at first in doubt as to whether the studs would remain in during work, or while the horse was standing in the stable; but, to my surprise, they were firmly retained in the shoes for a month, though subjected to every kind of test except on ice, which the season has not afforded.

A few blows on each side are sufficient to slacken them, when they require to be removed as no longer necessary, when worn out, or when they require to be re-sharpened. The weight of the horse evidently keeps them tightly fixed in the shoe, and, from their being of the same thickness throughout, there is little risk of their breaking. It would be advisable, I think, to have the shoes a little thicker and broader at the places where the holes are to be made. I anticipate that this mode of rendering all kinds of horses efficient during frost will be found eminently successful and very inexpensive, and one readily carried out anywhere in a very short time.*

SHOEING OF DEFECTIVE LIMBS.

Shoeing is a powerful auxiliary in the hands of a competent farrier, for remedying the natural defects which are not unfrequently observed in the position of the limbs and feet of horses; while to the scientific veterinary surgeon, it is no less a most potent aid in curing or palliating certain maladies or deformities of a special character.

* I have given a pattern of these studs to Messrs. Arnold, of West Smithfield.

Perhaps the most frequent defects the farrier has to contend with, are turning-out or turning-in the toe of the foot; both of which malformations are not only unsightly, but are productive of more or less injury to the limb, from the unequal manner in which some of its parts have to sustain the weight of the body.

To rectify the leg or foot when the toe turns outwards, the hoof should be levelled as before described, the margin of the wall at the outside-toe, and back nearly to the quarter, being well reduced and rounded. The clip is to be drawn up nearer to the inside than the middle of the toe; the shoe to be fitted close to the outside-toe and quarter, but the inside, from the quarter to the heel, should be more full than usual. In the course of several shoeings, by this reduction of the wall at the outside of the hoof, and the fitting of the shoe, a most noticeable improvement will be effected.

When the toe is turned inwards, precisely the reverse treatment must be followed: the inside-toe must be reduced, the clip of the shoe formed nearer the outside-toe, and the shoe itself fitted close at the inside-toe, but wide at the outside. In both cases the shoes ought to be of the same thickness throughout.

"Cutting," or striking and wounding the inner side of the leg with the opposite foot, is sometimes a cause of much annoyance. It may be due to weakness, fatigue, or to a sudden change in the manner of shoeing; in which cases it is only temporary. But it may also arise from malformed limbs or faulty action, and these defects may be so exaggerated as to be scarcely, if at all, remedied by shoeing alone.

The usual part of the hoof with which the horse strikes the opposite limb, is the inside-toe or quarter. Whichever of these regions it may be, the hoof must continue to be levelled at right angles to the direction of the pastern, and a shoe equally thick throughout applied, the only difference between it and the ordinary shoe being the removal of a portion of the iron from the margin at a point corresponding to the portion that causes the injury to the opposite limb; or the shoe, instead of being narrowed in the branch at this part, may be straightened, so as to lie within the hoof. No nails are to be inserted here; they may be placed in front of, and behind the striking portion—at the toe and heel. The hoof, after the application of the shoe, may then be reduced at the quarter with the rasp, to diminish its convexity, and thus avert "cutting" or striking.

The preplantar method of shoeing is well adapted for certain horses that "cut."

Some horses have the awkward habit of lying like a cow, with one or both fore legs doubled up at the knee, and the elbow resting on the heel of the foot. Should the ordinary shoes be worn, it almost inevitably follows that the ends of the branches pressing upon the elbow will cause the formation of a large unsightly tumour, which may in time become an abscess or ulcerate. The prevention of this is in the hands of the farrier, who has only to shorten and smoothly round the extremities of the shoe, so as to keep them within the hoof. Most frequently it is the inside heel, in which case a three-quarter shoe at once remedies the evil.

GENERAL MANAGEMENT OF THE HORSE'S FOOT.

After what has been said with regard to the management of the horse's foot in shoeing, there is but little to add concerning its general treatment; as shoeing influences, more or less, for good or for evil, the general condition of that organ, and renders its ordinary management either a matter of much or of trifling moment.

When it has been robbed of its horn by the farrier, and brought to such an artificial and abnormal state as we have indicated, then its preservation in anything like a healthy or efficient condition is a matter of no small difficulty, and appears sometimes to demand very curious, and often by no means reasonable, practices on the part of the groom.

The most common are: applying to the face of the wall tar, oil, fish-oil, or advertised mixtures of various kinds to make the horn grow, prevent brittleness, cure diseases, etc.; and to the sole plates of leather, bolsters of tow steeped in tar, filthy applications of cow-dung, mud or clay, and other matters.

It is scarcely necessary to say that to the unpared and unrasped hoof these are not only unnecessary, but some of them even positively hurtful. Oil, for instance, not only renders the wall brittle, but loosens the nails; while cow-dung, from the ammonia it contains, softens and destroys the frog.

The unmutilated hoof is easily kept in health. All it requires is keeping cool, and moistening occasionally with cold water during hot weather, or after severe exertion. When a journey

has been long continued and severe, the horse should not be immediately put into a stable, but ought to be walked gently about until the circulation of blood in the extremities has had time to accommodate itself to the altered conditions of rest. By this means congestion of the feet and laminitis (inflammation) is averted.

In washing the hoofs a water-brush should not be employed, but a soft sponge, with a view to prevent the translucent horn on the front of the wall being destroyed.

The sides and cleft of the frog may be cleaned out occasionally with a blunt picker, though if sound this is scarcely required.

Nothing more is needed, so far as the every-day stable management of the foot is concerned, except to caution the groom against cutting away the hair immediately above the coronet, as this acts like a thatch in preserving the frog-band, at its commencement, from the effects of perspiration and moisture.

Much harm is done to the legs and feet by the somewhat cruel custom of keeping horses, while in the stable, constantly tied up in one position in stalls with sloping floors. This fashion is not only entirely opposed to the animal's natural habits—for the horse loves to move about and change his attitude—but the limbs and feet, more especially the front ones, are, instead of being rested, greatly fatigued; and this brings about alterations which may be none the less serious because they are not immediate in their effects. Various bad and unsightly habits are also acquired, such as crib-biting, weaving, wind-sucking, &c.

A loose box with a level floor, even if no larger than a stall, is infinitely preferable, and by all means to be commended to those who place some value on the soundness of body, eyesight, and limbs of their horses, as well as regard their comfort.

STREETS AND ROADS.

The roads over which horses travel have also much influence for good or evil on the condition of the feet and legs. In the majority of the towns and cities in Great Britain, it would most certainly appear that considerations for the safety, comfort, or efficiency of the thousands of horses in daily use were altogether lost sight of, or neglected, in constructing the public thoroughfares.

Masses of the hardest and closest-grained stone are laid down in most streets in such a fashion, that they seem as if purposely designed to afford an insecure foothold, and prevent the horse's strength being profitably utilized. These paved streets—always a source of danger to the animals—while hindering them from employing their force to the best advantage, are also particularly injurious to the legs and feet from the incessant efforts made to maintain a footing. More especially is this the case in wet weather, when they are covered with greasy mud, and in summer when their dry smooth surface becomes *leaded*. It is needless to say, that no kind of metal defence to the hoof will for many days, if at all, ensure a firm foothold on such roads;

and nothing but a metal defence has ever been found suitable to the horse's foot.

Every device has been tried to meet the demands for travelling with ease and safety on such paved streets, and none have proved entirely successful. Nor is it at all likely that future inventions will entirely meet these demands; the basalt or granite pavement, perfectly smooth, and offering a most insecure surface for fixing the foot during movement, is not at all adapted for horse traffic.

From the durability of these roads, they may be, to those who have to pay for their construction and maintenance, more economical than others on which horses can journey with ease and without risk of falling down; but they are far from being economical to those whose carriages and waggons traverse them. A portion of the horse's motive power is devoted to maintaining his foothold, and the fear induced by this insecurity operates against what remains being applied as profitably as it ought to be. So that less is gained in the economy of construction and durability, and in the easier traction of vehicles, than is lost in the injury done to the horse's extremities, and the waste of power required to maintain its equilibrium.

Even more injurious to feet and limbs is the barbarous, slovenly, and stupid method prevailing in this country of repairing macadamised roads—or what are intended for them—by depositing a heap of angular stones in a loose rugged layer of uncertain depth, and compelling horses and carriages to travel over them until they are imbedded in a very irregular manner

in the soil beneath them. Such a practice is not only extremely short-sighted on the part of those who make or repair roads in this manner—as these roads can neither be durable nor very serviceable—but also deserves the severest censure as most cruel and destructive to horses. Not only is the labour in drawing a carriage over such a surface immensely increased, and the horse's strength thereby unprofitably expended, but the unstable footing afforded by the loose masses of stone throws a great strain in every direction upon the legs and feet, and not unfrequently the animal is thrown down, and becomes seriously injured or blemished for life.

If the hoofs chance to be pared and rasped according to the groom or farrier's "improved principles," then the consequences are greatly aggravated.

Certainly, within the last year or two, heavy rollers have been brought into requisition to crush in the new metal, and thus make a good and serviceable road; but the employment of these is still far from general, and unless public opinion be brought to bear more energetically against the suppression of this evil, it is to be feared that their number will not be increased, nor their utility more generally recognised.

The best mode of constructing and repairing our public thoroughfares and highways, with a view not only to economy, but to the safety and comfort of horses, is a matter that deserves serious attention.

Taken in connection with our subject, it is one that cannot be overlooked. We may preserve and defend the horse's foot to the best of our ability in our forges and stables, but if the

roads over which he travels are not adapted to his employment, our exertions on his behalf can only be partially successful.

The chief *desiderata* in a roadway are, durability, cheapness in construction, noiselessness during traffic, easy traction, and secure foothold for the horses travelling upon it. All these qualities should be found in a good road; and it is to be hoped that the day is not far distant when the material and the method of utilising it which will confer this great boon will be discovered.*

INSTRUCTION OF FARRIERS.

The foregoing instructions relative to shoeing are, in substance, those which I have been in the habit, for several years, of laying before the farriers in the different regiments in which I have served, and with an amount of success which amply rewarded me for the trouble I took to see that they were carried into practice. Not only have my own duties been considerably lightened in the greatly diminished number of lame and unserviceable horses, but the labours of the farriers have been considerably abbreviated and simplified; and by their being able to understand the reasons for acting as I desired, their

* The wood pavement now in process of laying near London Bridge, gives at present some reason to hope that it will be an improvement upon every other kind hitherto tried. It appears to be sufficiently elastic to relieve the horses' feet and limbs from the uncomfortable jar they experience on stone-made roads; it is comparatively noiseless; the traction is easy; and even when wet, it affords a good foothold. This is due, no doubt, to the direction of the fibres (vertical) in the cubes of which the upper stratum of the pavement is composed.

intelligence was awakened, and they took an interest in carrying out my views.

In our Army this is not always the case. The subject of farriery is often looked upon much as it is in civil life—as a matter that concerns the farrier only, and tradition and routine extensively prevail. In saying this, however, I do not intend for a moment to insinuate that the army veterinary surgeons are averse to giving their attention to a most important, though it may appear a minor, part of their duty. On the contrary, many of them do so, and with the greatest advantage to the service; but there is not the same encouragement offered either to veterinary surgeons or farriers, in this respect, as there is in Continental armies. In the French army, for instance, there are schools and professors of farriery, the most notable of these being at the cavalry school of Saumur. In these, the farriers are regularly trained to an uniform and approved system before being posted to different regiments, and direct encouragement is given to these men by the institution of competitions, in which the most successful are rewarded by medals and gifts of money.

But not only does the French Government bestow some care in the advancement of farriery in the army; it also stimulates competition and improvement among the civilian farriers. So late as the 28th, 29th, and 30th of April, 1870, there was a *concours* of 'maréchalerie' at Valence, divided into two sections—a civil and a military—presided over by two special juries composed of eminent veterinary surgeons and professors.

At this *concours*, not only were models of shoes and shod-hoofs exhibited, but the farriers—civil and military—were tested in the various operations of farriery on the spot, by shoeing saddle, carriage, and draught horses, draught and pack mules, and oxen. A large number of gold, silver, and bronze medals, as well as a considerable sum of money, were given away.

These *concours* cannot but effect much good, by attracting attention to this very important subject, and encouraging good workmen.

In Belgium there are also *concours*, and if I remember aright, farriers who attend them receive instruction from properly qualified veterinary surgeons, who are authorised to grant certificates of proficiency.

In both countries, as well as in Germany, the students at the veterinary schools are taught the principles and practice, and even the manual details, of shoeing, and this instruction is of great value to them in after life.

It is scarcely necessary to say that in this country nothing of the kind is attempted.

The Government does nothing to improve or encourage veterinary science in any way; hence the low state of this important branch of medicine and rural economy in Britain, and hence the enormous losses she has sustained for so many years. Hence, also, the degraded and barbarous condition of farriery, even in our cities and towns. With the exception of, on very rare occasions, the distribution of a prize or two at some local agricultural show to farriers, who imagine that

paring and rasping, and a fantastically wrought piece of iron, constitute the perfection of shoeing, the subject is thought unworthy of notice. Even at the veterinary schools during my matriculation, it was dismissed in a brief lecture of an hour, and then pathological shoeing was chiefly referred to. Nothing of the principles or practice was ever taught.*

When the Veterinary Colleges are so indifferent to a matter so closely related to the comfort and efficiency of the horse, we cannot wonder that veterinary surgeons, as a rule, and farriers, take but little interest in shoeing.

The remedy for this, of course, should be, in the first place, applied to the teaching schools. The anatomy and physiology of the horse's foot, its management in health and disease, and the principles and practice of shoeing, ought to be thoroughly inculcated.

It would be most advantageous if, when this course was adopted, farriers could be prevailed upon to attend, and after due examination as to their competency to practise their art in a rational manner, they were to receive certificates of profi-

* We have to note that since the first edition of this treatise was published, the Royal Veterinary College advertises that among the other subjects taught, the "Principles and Practice of Shoeing" are included. With regard to the Edinburgh Veterinary School, it may be mentioned that the Principal has published a work on "Veterinary Surgery," in which, in the very brief chapter devoted to horse-shoeing, he recommends a shoe in its essential features the same as that proposed by Mr. Thacker, and alluded to at page 81, and also points out the desirability of non-paring, the sole of the hoof taking its share in weight-bearing, and the hurtfulness of calkins, in words almost the same as these employed in this little essay. These are somewhat hopeful signs that the disgraceful neglect with which the subject of farriery has been treated at the schools may yet be remedied. It is to be feared, however, that in the excessively short period which is supposed to be sufficient to teach a young man the rudiments of a scientific and difficult profession, but a very small space will be devoted to the important question of how to preserve the horse's foot sound and efficient.

ciency as in Belgium—these certificates carrying with them similar advantages to those that the diploma of surgery confers upon the surgeon.

In default of this, veterinary surgeons properly qualified for the duty, and possessing the necessary convenience and opportunity, might be induced to receive and instruct apprentices in farriery, granting them authorised certificates when judged to be fit to practise the art.

Agricultural meetings should also be made the means of instructing farriers in shoeing, and of stimulating competition in the districts in which they are held. Of course, it must be a *sine quâ non* that the instructors and judges should themselves understand the subject thoroughly.

These are the only means by which, I believe, the art of farriery can be improved in this country, where nearly all improvement is left to private enterprise. A profound knowledge of the anatomy and physiology of the horse's foot is not absolutely necessary to the farrier. What I have sketched out on these subjects in this essay, I have generally found sufficient to enable my farriers to comprehend the nature of the organ they were called upon to protect and preserve, and this much was easily taught them in a short time. I have always had more difficulty in making them unlearn their unreasonable practices, than acquiring those which were novel, though easier; and my chief antagonists in all improvements have been the ignorant grooms and coachmen—the lovers of well pared and rasped hoofs, oiled or blacked like a boot; hot stables; physic; bearing-reins; blinkers; cruppers; powerful

bits; and everything, in fact, unnatural and injurious to the horse.*

* I do not wish to speak harshly of a class of men who have much improved, and who have shown themselves capable of further improvement, even since my experience of them began. Many of them are most excellent, intelligent, and trustworthy, and the welfare of the horses entrusted to their care is fully assured. Unfortunately, these excellent servants compose but a small fraction of the class, and, as a body, they require educating in the matter of horse-hygiene and horse-management, quite as much as the majority of the farriers do in horse-shoeing. Perhaps the time is not very distant when owners of horses shall require, in addition to an apprenticeship in the stable and on the coach-box, a certificate that the groom or coachman has attended an elementary course of lectures on veterinary medicine.